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THE DISTRIBUTION OF THUNDERSTORMS IN THE UNITED STATES, 1904–33

By WILLIAM H. ALEXANDER

[Weather Bureau, Columbus, Ohio, Dec. 10, 1934

This is the third and in all probability the last paper on the above topic by this writer. The first was published in the MONTHLY WEATHER REVIEW, July 1915, 43:322–340, and covered the 10-year period 1904–13; the second was published in the July 1924 issue of the REVIEW, 52:337–343, and covered the 20-year period 1904–23. The reader is referred to the first of these papers for a general introductory statement to the discussion, and for a rather comprehensive account of the methods or rules used by both the Weather Bureau and its predecessor, the Signal Service, in recording thunderstorms, prepared by C. F. Talman, librarian of the Weather Bureau in Washington, D. C. The lines on the charts are in some cases slightly smoothed; and lines are not always drawn around single isolated values. *On the June chart, the value 378 at Macon, Georgia, should be 318.* As a 30-year record probably affords a safe and reliable basis for these charts, perhaps a few observations regarding them will not be out of place.

In the first paper, the discussion of the monthly charts was begun with that for December, for the reason that December seemed to have fewer thunderstorms than any other month; but the 30-year record seems to prove this statement erroneous, and so we now begin with the January chart (fig. 1). The January 30-year chart, as in the case of the 20-year chart, shows the center of thunderstorm activity for that month to be over northern Louisiana; there is also considerable activity in all the Gulf States and in the South Atlantic States as far north as the Carolinas, and in the Mississippi Valley States northward to and including Missouri and the lower Ohio and Tennessee Valleys. While the western half of the country is relatively free from thunderstorms during the month of January, there is a rather significant isoceraunic [1] over northern Utah.

Turning our attention to the February chart (fig.2), we note a very considerable increase in thunderstorm activity in all the Gulf States and in the Ohio and Tennessee Valleys and northward to the Lake region, and the center of this increased activity has shifted a little east and is apparently centered over Mississippi, southern Alabama and extreme western Florida. The western secondary, still quite weak, now appears over southern Arizona.

Figure 3 seems conclusively to establish the fact that the center of greatest thunderstorm activity during the month of March is over southern Arkansas, west-central Mississippi and extreme northeastern Louisiana, and not over Kentucky and Tennessee as indicated by the chart based on a 10-year record. The area of increasing thunderstorm activity has continued to spread rather rapidly north and east, and now includes practically the entire eastern half of the country. There has also been an increase over the Southwest, notably in Arizona, New Mexico, and Utah.

During the month of April (fig. 4) we see a slight westward shift of the center of greatest thunderstorm activity, and northeast Texas is now included along with northern Louisiana and Arkansas. Practically no part of the United States is entirely immune from these storms in the month of April though they are quite rare along the Pacific coast; and activity is becoming notably pronounced in the southern Rocky Mountain States.

The May chart (fig. 5) reveals at least one very interesting and significant development, apparently not foreshadowed on any of the preceding charts, namely, the sudden appearance of a very definite secondary center of activity on the west Florida coast in the vicinity of Tampa. The primary center is now showing a tendency to move or spread northward into Missouri and northeastward into the Ohio and Tennessee Valleys. The active center for the western half of the country is still over the southern Rocky Mountain States, and thunderstorm activity has increased generally over the country.

The most obvious fact revealed by the June chart (fig. 6), perhaps, is that thunderstorms are now general and rather frequent over all eastern and central districts, including some of the Rocky Mountain States; and the most interesting fact is that the Florida center of activity has now become the *primary* center and includes several of the Southeastern States, while the secondary center is apparently over Colorado. In the area of greatest activity, thunderstorms occur on the average about every other day, and in the secondary area, about every third day.

We now come to the month of maximum thunderstorm activity, namely, July (fig. 7). The outstanding feature of this month is the marked increase in thunderstorm activity over the Rocky Mountain States; the secondary over the Southwest has about the same intensity as the primary over the Southeast, the latter recording a total

[1] The following terminological note by C. F. Talman is reprinted from the Monthly Weather Review, July 1924, 52: 337. In 1879 W. von Bezold and C. Lang applied the name "isobront" to a line drawn on a chart connecting places at which the first thunder in a thunderstorm was heard simultaneously. The word has since become fully established in meteorological literature with a somewhat broadened meaning, being applied generically to thunderstorm isochrones, including those of first thunder, loudest thunder, beginning of rain in a thunderstorm, etc. A chart of isobronts shows the progress of a particular thunderstorm across the country.

To avoid confusion, some different name should be applied to lines of *equal thunderstorm frequency*, such as appear on Mr. Alexander's charts and on charts of similar character that have been drawn for other countries and for the world at large. It is suggested that the isogram of thunderstorm frequency be called an "isoceraunic line", or, briefly, an "isoceraunic" (also spelled "isokeraunic"). "Isobront" and "isoceraunic" are formed from familiar Greek words, the former meaning literally "equal thunder" and the latter "equal thunder and lightning."

of 655 days with thunderstorms in the 30 years, and the former 641. The number of days with thunderstorms has increased along the Mexican border, but the Pacific coast is still practically immune.

During the 7 months, January to July, inclusive, thunderstorm activity has been *increasing* both as to intensity and area covered. In August (fig. 8) we detect the first evidence of disintegration, as shown in the (as yet slightly) diminishing number of thunderstorm days along the Canadian border, and in the weakening of the secondary over the Southwest. However, the average is still high over the southern half of the country; the Pacific coast is nearly free from these phenomena, especially the northern California coast.

The most obvious fact revealed by the September chart (fig. 9) is that thunderstorm activity is rapidly diminishing over the entire country, unless it be along the Pacific coast where there seems to be a very slight increase. The two centers of activity, the primary over Florida and the secondary over northern New Mexico, still persist but both are now weakening rapidly; in fact, a strong secondary is now forming over the middle Mississippi Valley. There is little thunderstorm activity in September along or north of the Canadian border.

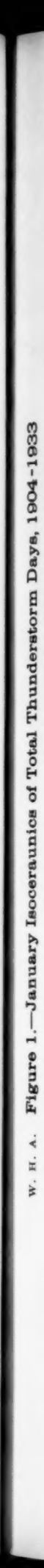
In October (fig. 10), the primary center that has been over Tampa for so long seems to have dropped south and is now over Key West, and the secondary is over the Arkansas-Oklahoma border, while a remnant of the erstwhile active secondary over New Mexico persists; but there has been a marked slowing-up of thunderstorm activity generally over the country, the storms being relatively most frequent in Florida and the southern Plains and lower Mississippi Valley States.

As is to be expected, the November chart (fig. 11) shows a still further diminution in thunderstorm activity and in the area covered; in fact the thunderstorm is now relatively rare in all parts of the country, the region of greatest frequency being the Ohio and lower Mississippi Valleys. Both the Florida and the southwest centers have practically disappeared, and the interior portions of the Atlantic States from Georgia to Maine are now almost immune.

The December chart (fig. 12) again reveals the center of greatest thunderstorm activity over northern Louisiana, and very little activity outside of the lower Ohio, lower Mississippi and the Gulf States.

This brings us to the conclusion of the whole matter, namely, a consideration of the annual chart (fig. 13). This chart shows the total number of days with thunderstorms at a large number of stations for the past 30 years (1904–33); it brings out very conspicuously the two great centers of activity, one over Tampa, Fla., and the other over Santa Fe, N. Mex. It is interesting to note that the average number of days with thunderstorms at Tampa is exactly the same, 94, for the 20-year and the 30-year records; the average at Santa Fe for the 20-year record was 73 and for the 30-year record 72; these facts substantiate somewhat the statement in the concluding sentence of the first paragraph of this article, namely, that these charts give *trustworthy* averages. One lesson to be drawn from the annual chart is that no part of the United States is entirely free from thunderstorms. The fact that the topography of Tampa differs so materially from that of Santa Fe introduces some interesting considerations. Tampa is at sea level and Santa Fe 7,013 feet above sea level.

In conclusion, the writer wishes to thank the Chief of the Weather Bureau for permission to gather the data for this paper, and the numerous officials in charge of the stations for supplying them. Through the courtesy of the Meteorological Service of Canada, data from Canadian stations near the border have been used in the present paper.



THE PENNSYLVANIA FIREBALL OF FEBRUARY 27, 1935

By CHARLES P. OLIVIER

[Flower Observatory, Upper Darby, Pennsylvania, May 1935]

At 6:20 p. m., eastern standard time, February 27, 1935, a fine fireball was seen to fall over Pennsylvania. Efforts to obtain reports of observations were at once made through the newspapers and otherwise. As the body appeared while twilight was still too bright for stars to be visible, good positions were reported only because the planet Venus was in the same part of the sky as seen from eastern Pennsylvania in general. The phenomenon attracted further attention because of the long-enduring train which was left.

In all, 16 observations were reported, as given in table 1. All 16 were concentrated in the sector from northeast to east of the path of the object. It was unfortunately impossible to get any reports from south, west, or north, though the fireball must have been visible from those directions. Seven of the observations received were available for the determination of the height of the upper end of the train, and five for the lower end. It is probable that the body itself was visible considerably higher, but all the observations obviously refer to the upper end of the train.

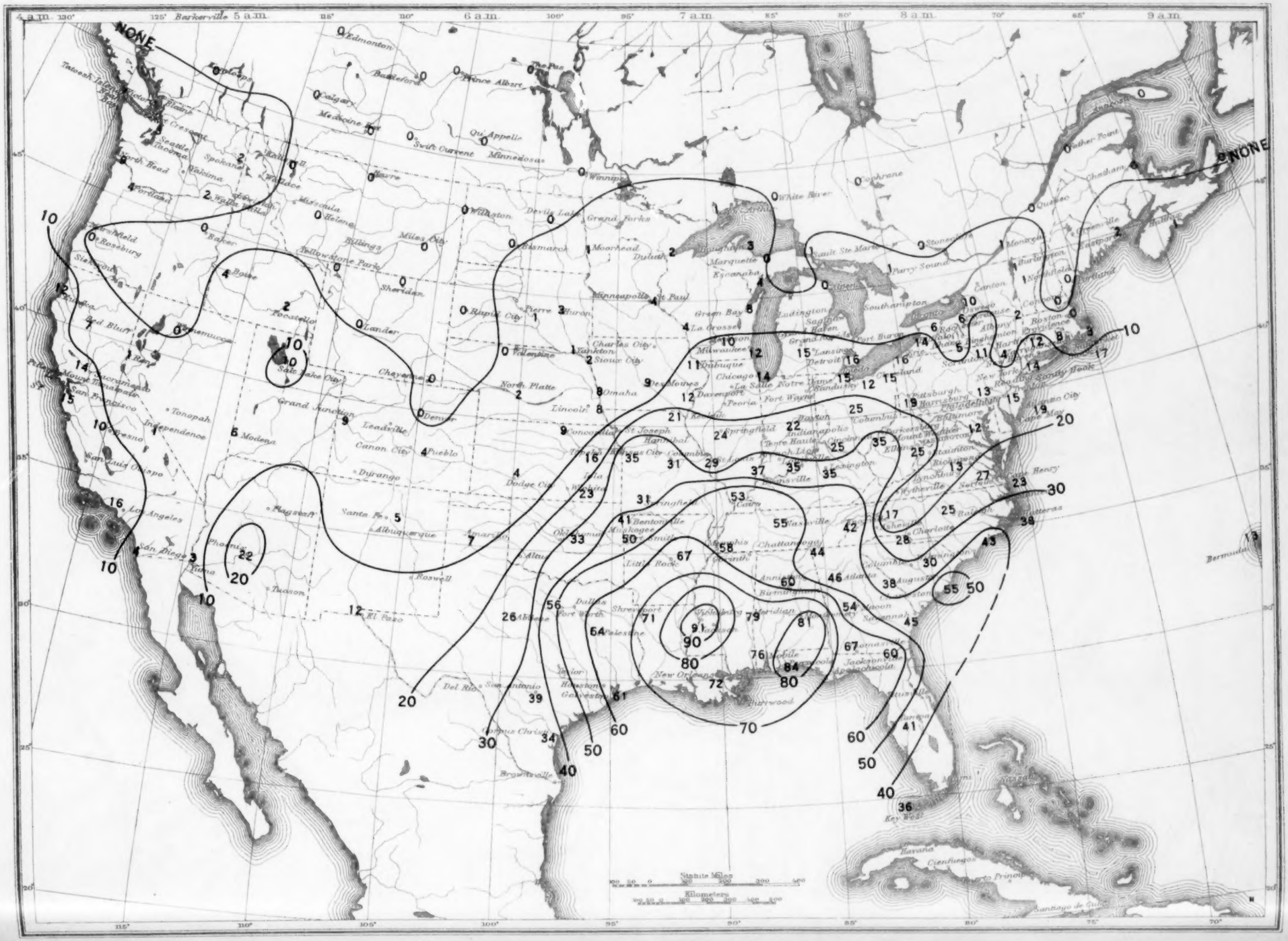
TABLE 1

No.	Station	Observer	Color	Duration (seconds)	Duration of train (minutes)
1	Glenolden, Pa.	F. W. Smith	Y-W	1±	13
2	Pottsville, Pa.	J. D. Smith	Y		4
3	Philadelphia, Pa.	W. R. Brown		1−	15
4	Philadelphia, Pa.	F. F. James		1−	2+
5	Devon, Pa.	E. A. Skilton			
6	Philadelphia, Pa.	E. Udell		<6	10
7	Allentown, Pa.	C. H. Hoffman	Y		5
8	Magnolia, N. J.	Mrs. E. J. Schmidt			
9	Glenside, Pa.	Mrs. H. P. Camden			2+
10	Philadelphia, Pa.	N. Mendelsohn			
11	Wynnewood, Pa.	Mrs. Rose E. McCarthy			12
12	Paoli, Pa.	J. B. Patton			
13	Reading, Pa.	H. E. Hathaway	B-R-Y	1+	9+
14	Reading, Pa.	S. Lash	Y	1−	5+
15	Mehoopany, Pa.	W. R. English	Y-R	<5	20-25
16	Rutherford, N. J.	W. F. Miner	O-Y	2	8

The data given in table 2 were calculated from the observations. As Venus was most fortunately at the right altitude as well as the right azimuth, to serve as a reference point, we may have confidence in the geo-

W. H. A. **Figure 1.—January Isoceraunics of Total Thunderstorm Days, 1904-1933**

W. H. A. **Figure 2.—February Isoceraunics of Total Thunderstorm Days, 1904-1933**



W. H. A. **Figure 3.—March Isoceraunics of Total Thunderstorm Days, 1904-1933**

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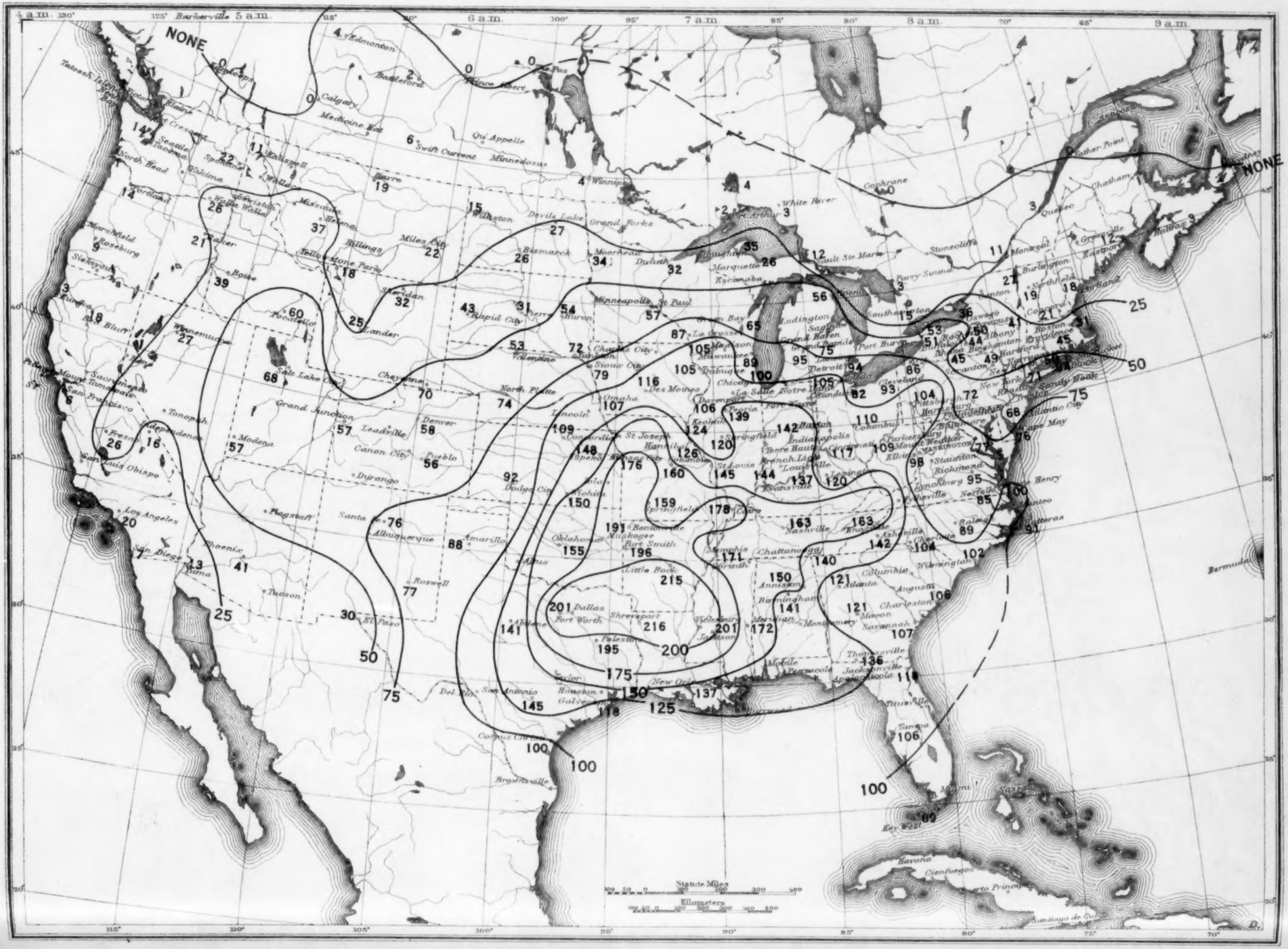
W. H. A. **Figure 4.—April Isoceraunics of Total Thunderstorm Days, 1904-1933**



W. H. A. **Figure 5.—May Isoceraunics of Total Thunderstorm Days, 1904-1933**

Figure 5.—May Isoceraunics of Total Thunderstorm Days, 1904-1933

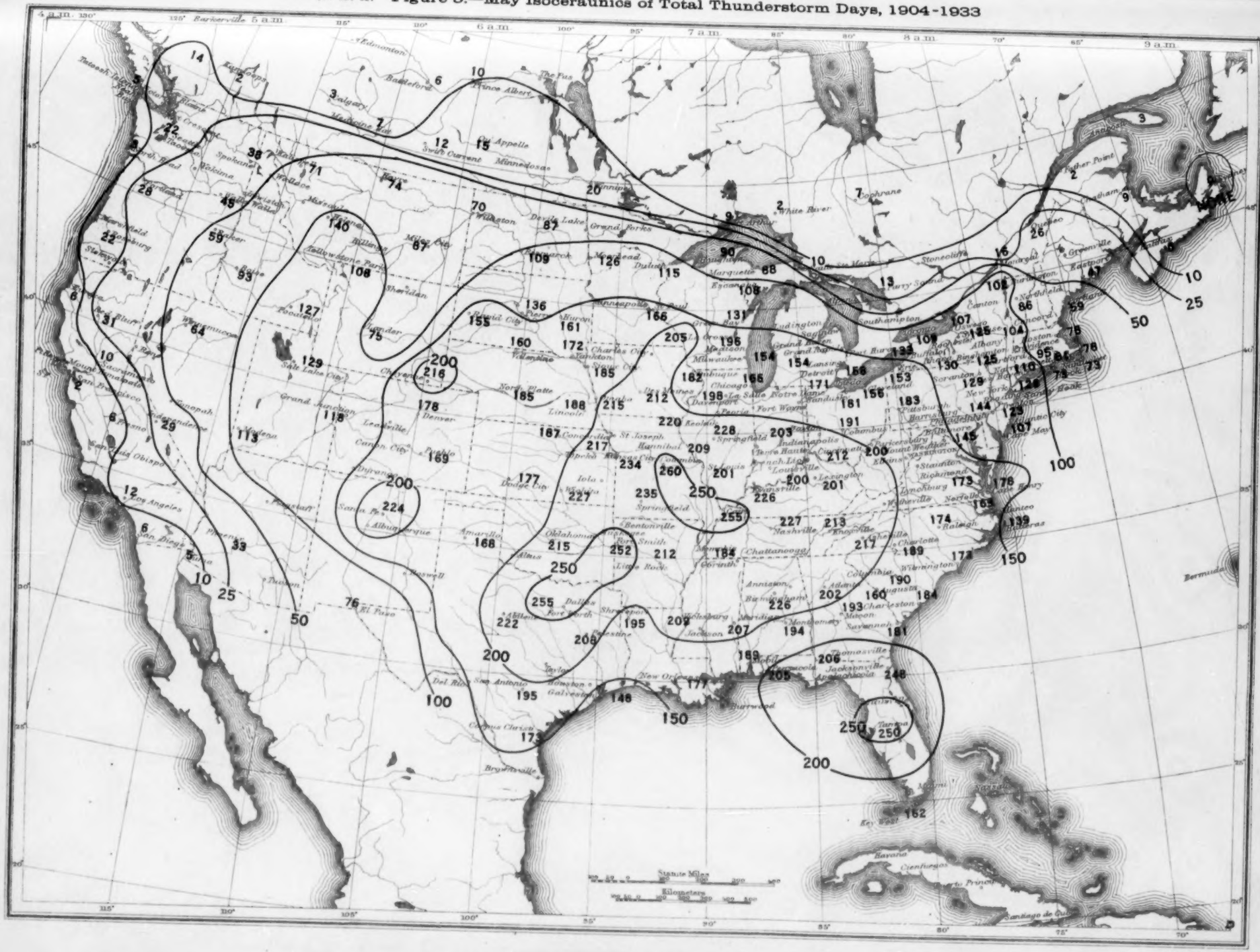


Figure 6.—June Isoceraunics of Total Thunderstorm Days, 1904-1933

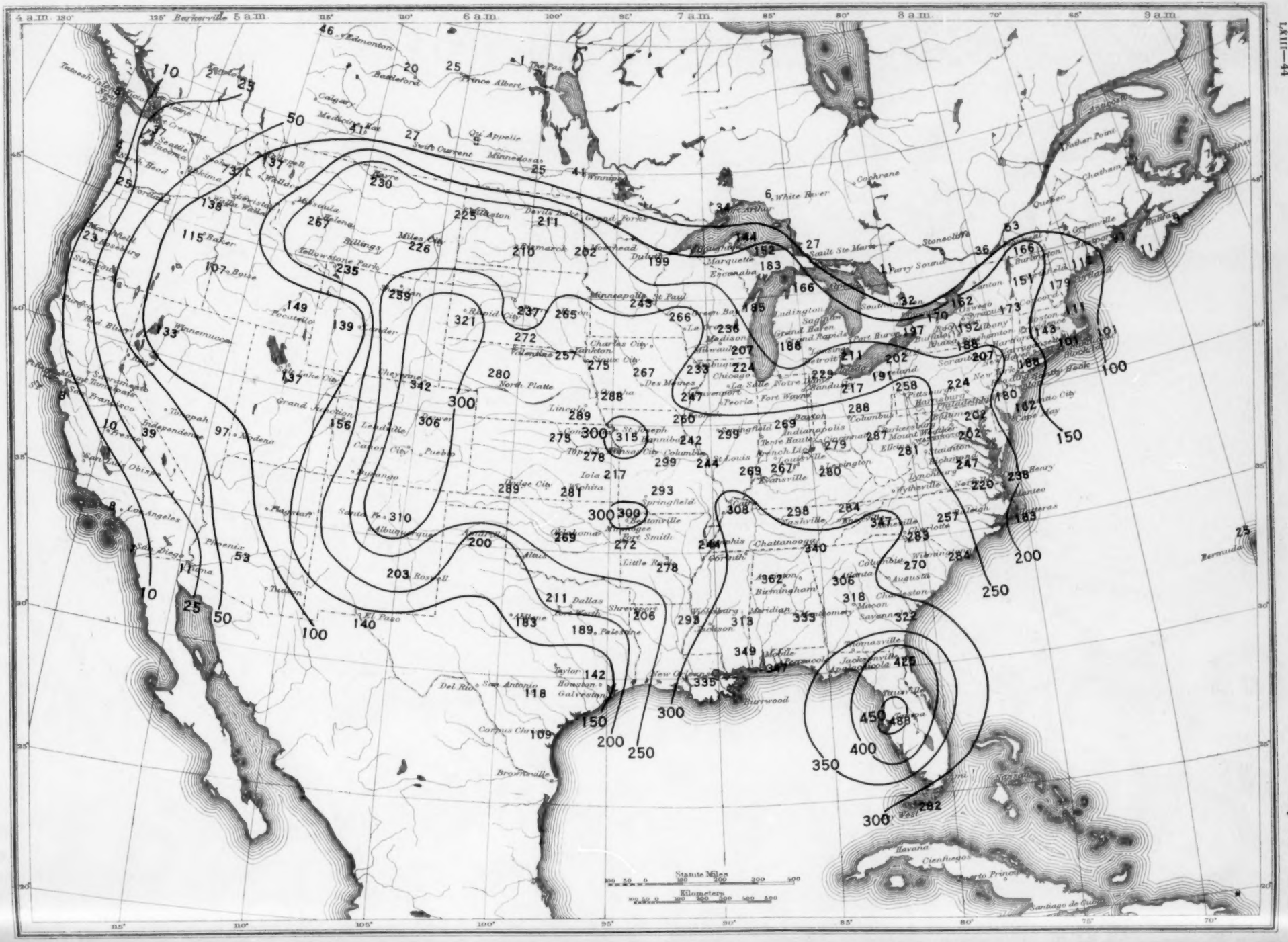
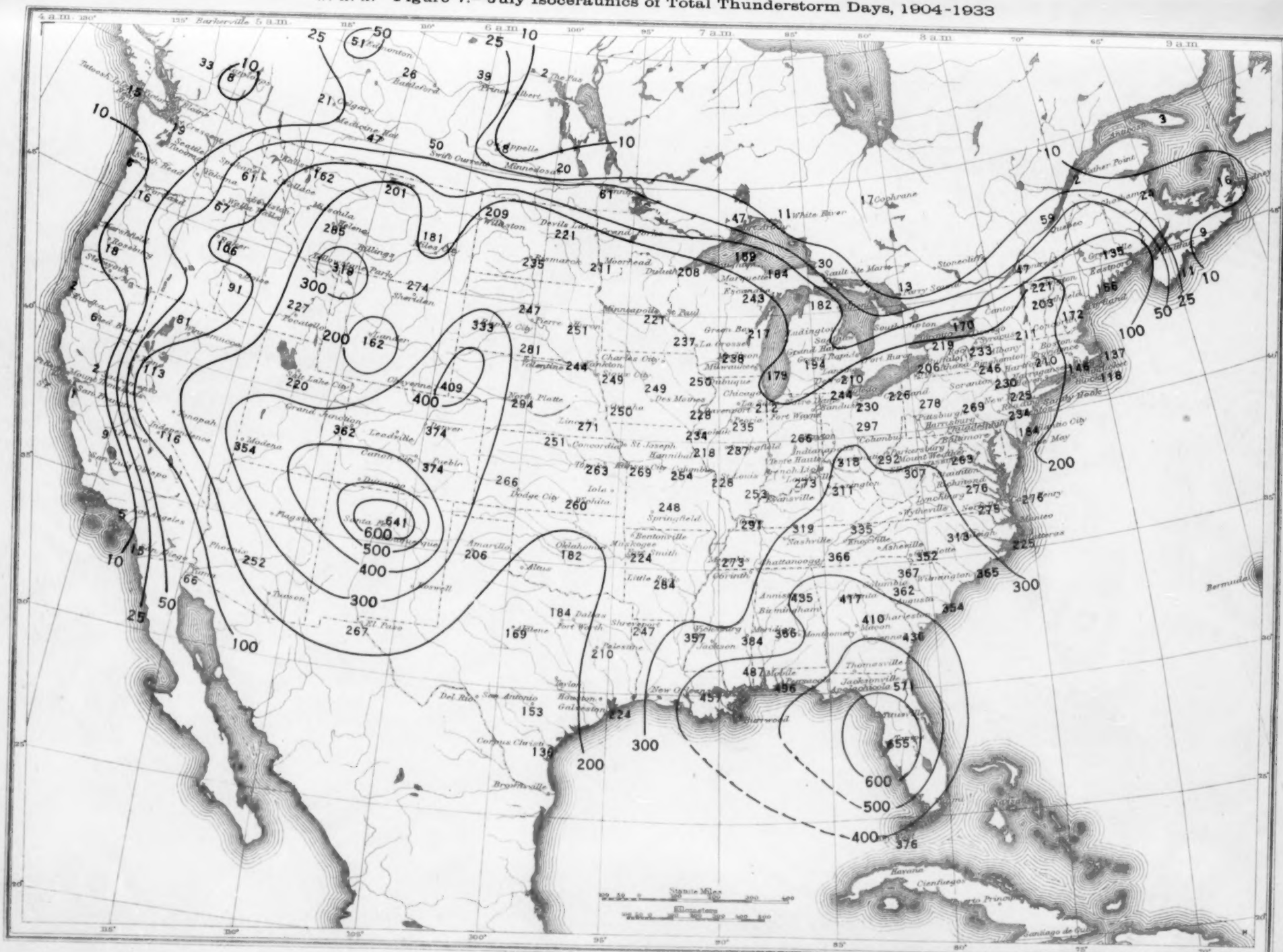
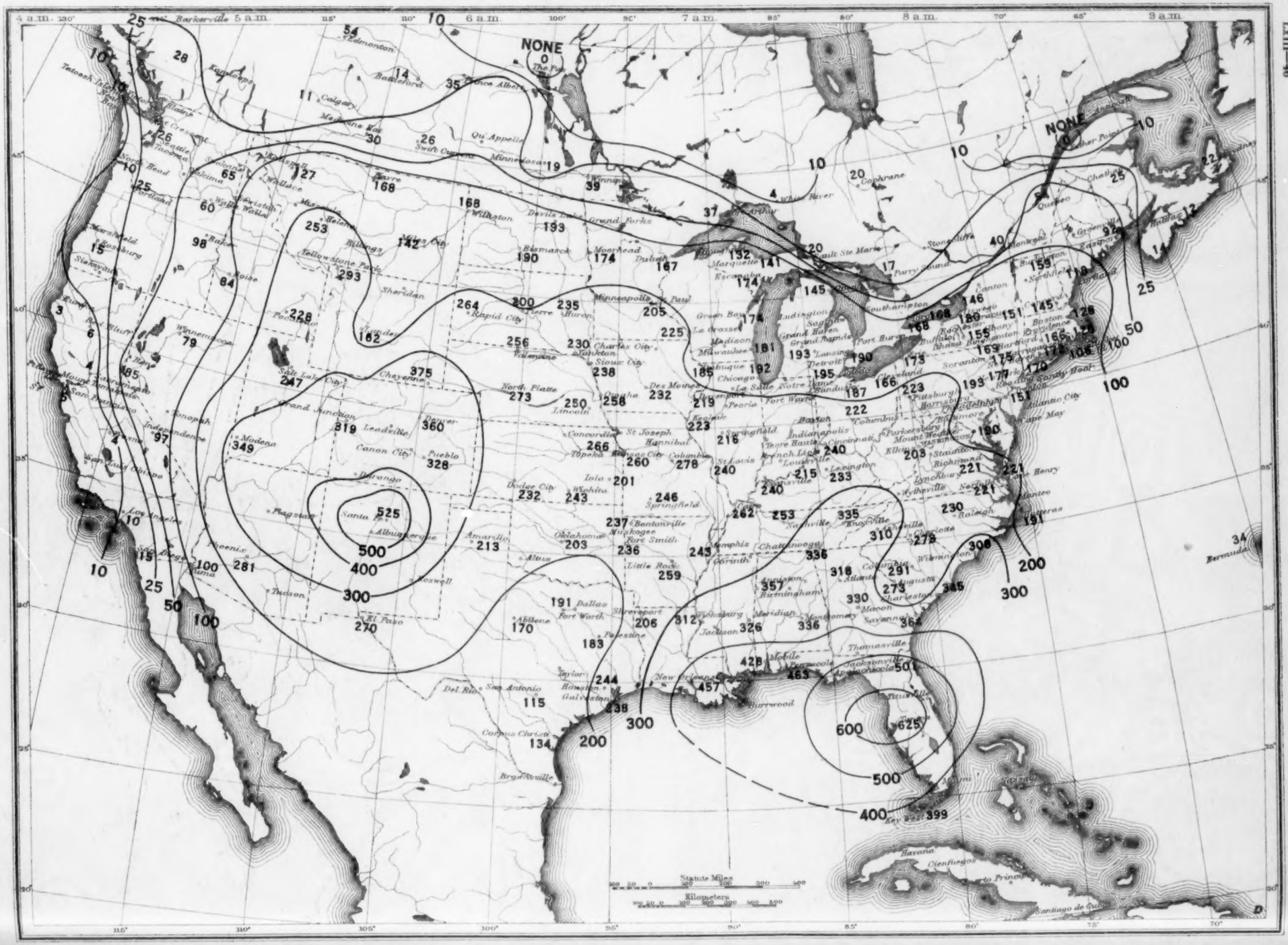


Figure 7.—July Isoceraunics of Total Thunderstorm Days, 1904-1933



W. H. A. **Figure 8.—August Isoceraunics of Total Thunderstorm Days, 1904-1933**



W. H. A. **Figure 9.—September Isoceraunics of Total Thunderstorm Days, 1904-1933**

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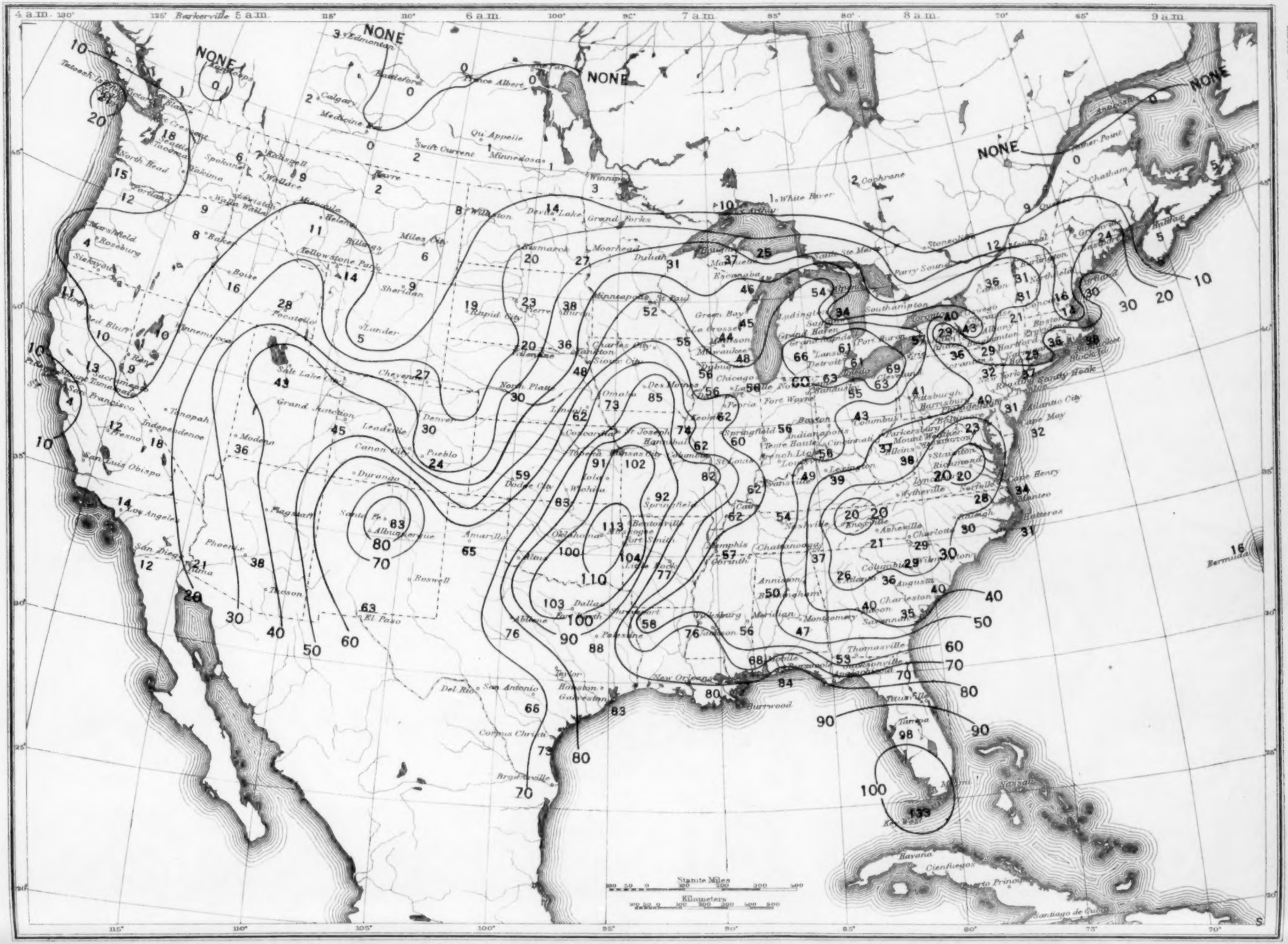
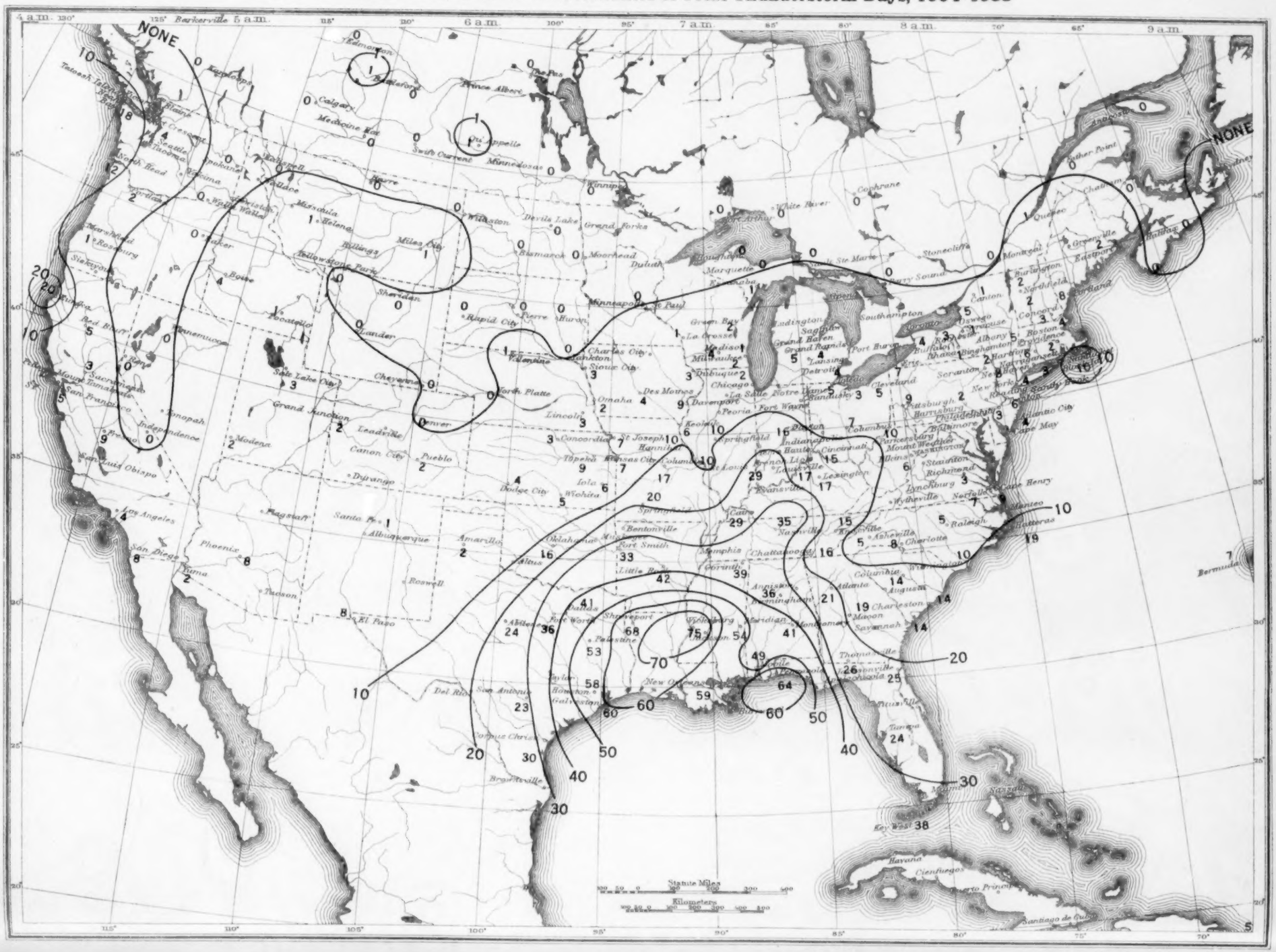
W. H. A. **Figure 10.—October Isoceraunics of Total Thunderstorm Days, 1904-1933**



W. H. A. **Figure 11.—November Isoceraunics of Total Thunderstorm Days, 1904-1933**

Figure 11.—November Isoceraunics of Total Thunderstorm Days, 1904-1933

W. H. A. **Figure 12.—December Isoceraunics of Total Thunderstorm Days, 1904-1933**



W. H. A. **Figure 13.—Annual Isoceraunics of Total Thunderstorm Days, 1904-1933**

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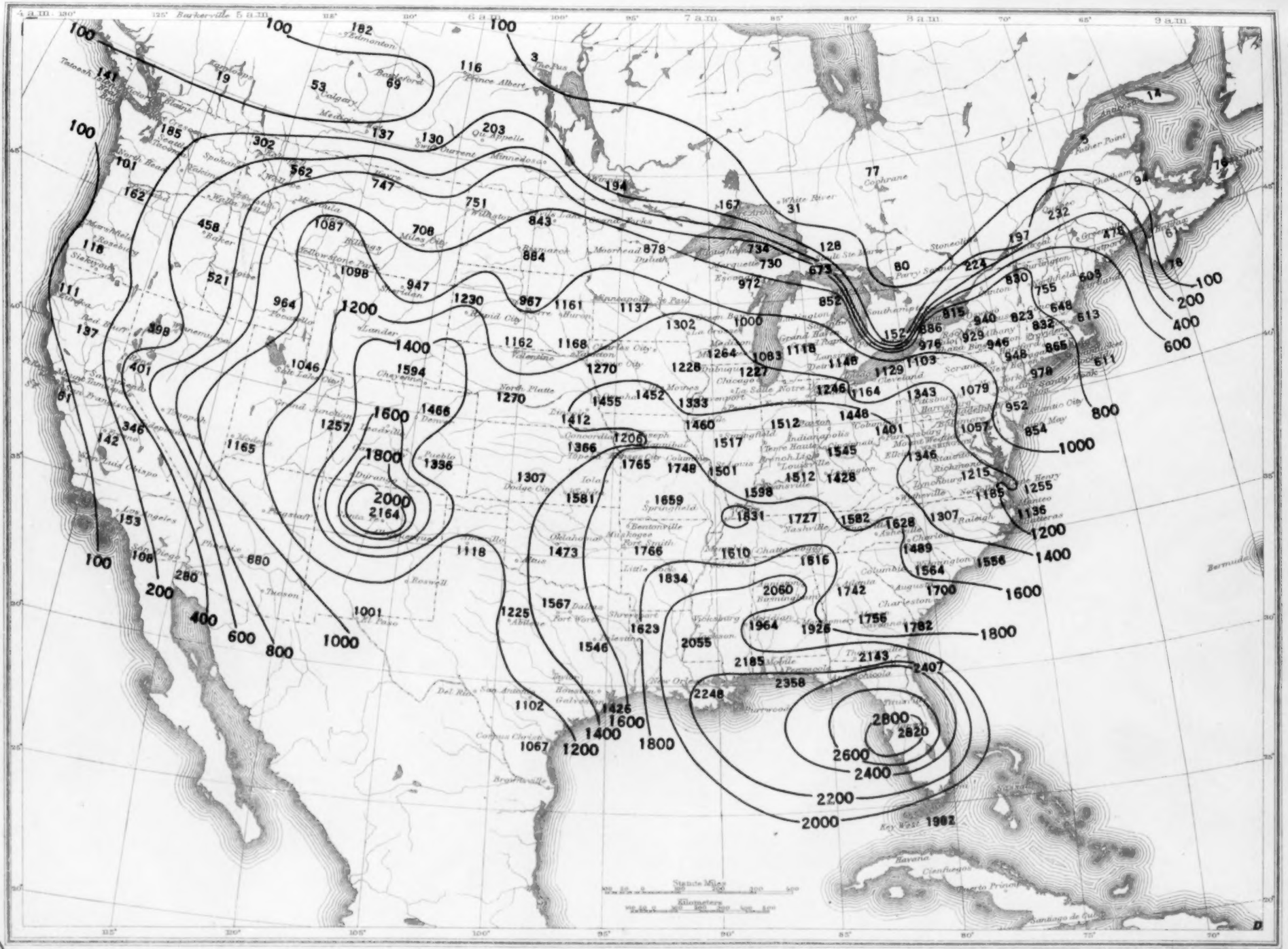

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A typical fireball train, March 24, 1933. (*Upper*, near Dalhart, Tex., Bert D. Latham. *Lower*, Timpas, Colo., C. R. West.)

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graphical location of the end point in spite of the distribution of observing stations; and as the path was nearly vertical there can be little more error in the location of the beginning point.

TABLE 2

Date: 1935 February 27, 6:20 p. m., eastern standard time.
Sidereal time at end point: 69°10′.
Ended over: $\lambda=77°41'$, $\varphi=+40°11'$.
Height at beginning of train: 61.7 ± 7.8 km.
Height at end of train: 31.1 ± 3.3 km.
Length of path: 30.9 km.
Radiant (uncorrected): $\begin{cases}a=233° \\ h=82°\end{cases}$
Radiant (corrected): $\begin{cases}a=233° \\ h=81°\end{cases}$ $\begin{cases}a=79°.5 \\ \delta=+45°.7\end{cases}$
Velocity of train drift (minimum) at 62 km: 121 km/hr.
Velocity of train drift (minimum) at 29 km: 79 km/hr.

The fireball itself was considerably brighter than Venus; and the duration of the train was certainly 12 minutes or more. Several drawings of the train were sent in, all showing most clearly that from a straight line at the beginning, almost vertical but sloping slightly from north to south (the angle as seen from due east was 85°), it gradually took the form of a zigzag line with two major projections, one at the top and one at the bottom. F. W. Smith at Glenolden, a trained meteor observer, plotted the train to scale on a star map, and our calculated velocities of drift depend on his drawing. The other reports were most useful in confirming the direction of the upper and lower drifts, and in very roughly confirming their values. Unfortunately, lacking any similar drawing made from a station more or less at right angles to his, we can deduce only the *projected* and therefore *minimum* drift. There is some reason to think, from a study of all the accounts and drawings, that for this train the drift was actually to north or south, so that these minimum figures are approximately the true ones.

Smith's drawings, made with the aid of an opera glass, show three bulges to the north and three to the south; the approximate drifts, in order of decreasing altitude, are given in table 3. With allowance for inevitable errors of observation, it is clear that several superimposed currents were flowing in opposite directions, the most marked being at the top and bottom. These were clearly drawn by other observers, as well as by Smith.

The visible train was wholly below the limit of 75 km given by Trowbridge for long-enduring night trains; his theory for their long visibility would presumably not apply, and we are forced back upon reflection from dust or smoke as the more probable explanation. Calculations based upon the motions of the train give approximate wind velocities at several altitudes far above the earth's surface, altitudes in general too high to be reached by sounding balloons. The motions further illustrate the complexity and diversity in direction of these winds, and the danger of theorizing on the few data so far available.

The writer is greatly indebted to H. E. Hathaway of the U. S. Weather Bureau Office at Reading, Pa., for much help in obtaining several of the observations.

TABLE 3

Altitude	Velocity of drift	Direction of drift
km.	*km/hr*	
62	121	N. to S.
47	82	S. to N.
44	30	N. to S.
42	52	S. to N.
39	38	N. to S.
29	79	S. to N.

RELATION OF SEASONAL TEMPERATURES IN THE MISSOURI AND UPPER MISSISSIPPI VALLEYS TO ANTECEDENT PRESSURE DEPARTURES IN OTHER REGIONS

By T. A. BLAIR and A. G. TOPIL

[Weather Bureau, Lincoln, Nebr.]

Although it is well known that pressure changes in various parts of the world are more or less closely related to subsequent weather changes in distant places, it is not possible in the present state of knowledge to say with certainty and without trial what widely-separated places will show a high degree of relationship. Hence, the work of finding such relations remains largely on an empirical, exploratory basis of trying out various combinations in the hope of finding some results of value, either for immediate application to forecasting or for the accumulation of data which, it may be hoped, will lead finally to some general interpretation of the interactions of the atmosphere.

During the winter of 1933–34 a large number of simple correlations of this character were calculated with funds provided by the Civil Works Administration, as has been reported by Weightman.[1] In one group of these, one element considered was the average temperature by seasons in the Missouri and upper Mississippi valleys, called district 5, computed from the records of 10 first-order Weather Bureau stations. The relations between these temperatures, and the pressures in some previous season at each of 69 stations distributed in all parts of the world, were determined separately. For the 4 seasons there were 12 correlations for each pressure station, or a total of 828 correlation coefficients for the 69 stations. A number of these were large enough to indicate a definite connection between temperatures in district 5 and previous pressures elsewhere, but none were of sufficient magnitude to have any positive forecasting value. The largest was 0.679, connecting the spring temperatures in district 5 with the pressures at Midway Island during the preceding summer, 9 months earlier. In all there were 21 coefficients greater than 0.400.

The question naturally arises whether a better result can be obtained by using two or more stations, and considering their combined relation to the temperatures in district 5. A few such calculations, using two pressure stations, have been made, and the results are set out in table 1. The method of procedure was to select 2 of the 69 stations which showed important simple correlations with the temperatures of a given season, and to calculate from these total correlations the multiple correlation coefficients, using the formula,

$$R^2_1=\frac{r^2_{12}-r^2_{13}-2r_{12}r_{13}r_{23}}{1-r^2_{23}}.$$

In this equation the r's are the simple correlation coefficients that connect pairs of the values to be correlated,

[1] R. H. Weightman, Preliminary Report on Relationship between Temperatures in the United States and Precedent Pressures outside the United States; Transactions, American Geophysical Union, 15th Annual Meeting, April 1934, Part I, pages 12, 13.

indicated by the subscripts 1, 2, and 3; the subscript 1 indicates the temperature element.

In a few cases we have derived regression equations, and computed the departures of the temperature from normal on the basis of their relations to the pressure departures at the two distant stations. Table 2 contains one set of the observed and calculated values for each of the four seasons, and in figure 1 these values are compared graphically. Numerically, the degree of correlation between the observed and calculated values is expressed by the multiple correlation coefficient.

The regression equations take the simple form $x_1=ax_2-bx_3$, in which

$$a=\frac{(r_{12}-r_{13}r_{23})\sigma_1 x_2}{(1-r^2_{23})\sigma_2}$$

and

$$b=\frac{(r_{13}-r_{12}r_{23})\sigma_1 x_3}{(1-r^2_{23})\sigma_3},$$

where σ is used for standard deviation. In order to get identical years of record for the three stations concerned in each multiple correlation, it was necessary to recalculate the simple correlations. Hence, the original C. W. A. computations have not been used in this paper except as a guide in the selection of the records to be correlated.

For the autumn temperature departures in the Missouri and upper Mississippi Valleys the best relation found was with the preceding spring pressure departures at Nome and at South Orkney, for which 22 years of record were available. The simple correlations in this case were: Temperature and Nome pressure, 0.438; temperature and South Orkney pressure, —0.579; pressures at Nome and South Orkney, 0.090. These gave a multiple correlation coefficient of 0.760 and a regression equation of $\Delta T_A=0.12\Delta P_N-0.47\Delta P_{S\cdot O}$. The curves of observed and calculated values, figure 1, give evidence of rather close agreement. They agree in sign 81 percent of the years, and there is complete agreement in sign whenever calculation forecasts a departure greater than 1°. Twice the calculated value misses the true value by as much as 2°, but the average error is 1.05°. The average observed departure is 1.55°. The two coldest seasons are correctly indicated by the two greatest calculated negative departures.

The second set of curves is for the winter temperatures in district 5, calculated from the preceding summer pressures at Honolulu and autumn pressures at Dutch Harbor. Simple correlations between temperatures and pressures are —0.599 and —0.411, respectively, and between the two pressures, 0.183. The multiple correlation coefficient is 0.641 and the equation is $\Delta T_W=-0.82\Delta P_H-0.11\Delta P_{DH}$. The coefficient is smaller and the agreement obviously poorer than in autumn. Departures are of the same sign 55 percent of the time, and when the calculated departures are 1° or more, there is 75 percent agreement in sign. The two coldest winters are correctly indicated by the computed values, but there are four large errors, ranging from 3.9° to 5.7°. It will be noted that the calculated values average numerically less than the actual departures, and this is true in all the cases considered.

For spring we used pressure departures of the previous summer at Midway Island and at Lagos, Nigeria, for a period of 17 years. The simple correlation coefficients are: Temperature and Midway pressure, 0.679; temperature and Lagos pressure, —0.558; Midway and Lagos pressures, —0.285. The multiple coefficient is 0.778, and the equation is $\Delta T_{Sp}=0.34\Delta P_M-0.51\Delta P_L$. This is the highest coefficient obtained and the curves show a close agreement in most years. The departures are of the same sign in 15 of the 17 years, and in both cases of disagreement the calculated values are 0.2° or less and the observed values, 0.6° or less, so that in all years where either value is greater than 1° there is complete agreement in sign. The error of the computed values averages 1.0°; it is less than 1.0° in 10 cases, between 1° and 2° in 5 cases, and greater than 2° in 2 cases. The actual variation of the temperature as expressed by the average numerical value of the departures is 1.6°.

Finally, for summer we used pressure departures of the previous winter at Tokyo and the previous autumn at Rio de Janeiro, and with these stations a 40-year record was available. The simple correlation of temperature with Tokyo pressure is 0.413 and with Rio de Janeiro pressure 0.485, and that between the two pressures is 0.128. These resulted in a multiple correlation coefficient of 0.600 and a regression equation of $\Delta T_{Su}=0.75\Delta P_T+1.21\Delta P_R$. This equation gives values agreeing in sign in 29 of the 40 years, or 72 percent of the time. When the computed departure is 1° or more they agree 80 percent of the time and when the observed departure is 1° or or more, 81 percent of the time. The variation of the observed values from normal is 1.5°; the error of the calculated values is 0.8°. The error is greater than 2° in 6 years, the greatest being 3.0°.

Returning to table 1, it will be noted that there are 20 multiple coefficients, ranging in value from 0.530 to 0.778. Thirteen of these have a value of 0.600 or more, and consequently have a forecasting value approximately equal to those for which the curves have been shown. Pressure in the north Pacific, as represented by Nome, Dutch Harbor, Markova, Honolulu, and Midway Island, occurs in 13 of the 20. The other pressure stations used are widely scattered, including points in Canada, British West Indies, Africa, Arabia, and Japan in the northern hemisphere, and including Rio de Janeiro, South Orkneys, and Batavia in the southern hemisphere. In the four cases for which computed values were obtained the average error was 1.24°, which is just two-thirds of the average observed departure of 1.86°. There is thus a 33 percent advantage in using the formulas; in summer the advantage is 46 percent.

We conclude that by the use of multiple correlation coefficients and regression equations, two largely independent pressure relationships can be combined to obtain fairly accurate indications of subsequent seasonal temperature departures in the Missouri and upper Mississippi Valleys on the average. These indications fail rather widely, however, in occasional individual years.

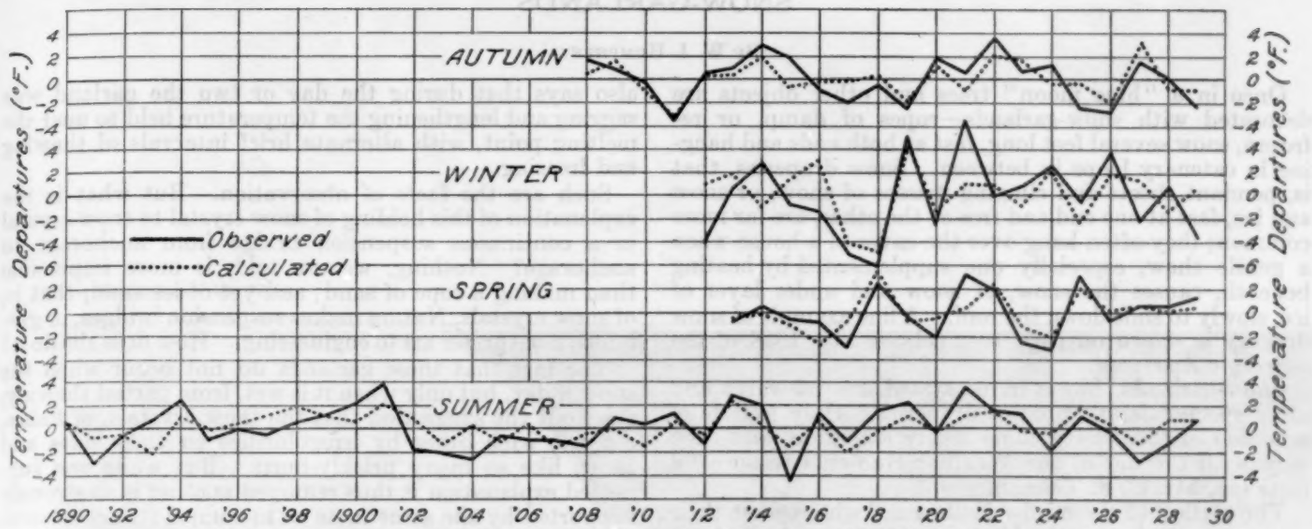


FIGURE 1.—Observed and calculated temperature departures in the Missouri and upper Mississippi Valleys.

TABLE 1.—*Multiple correlation coefficients. Temperatures are seasonal averages for 10 stations in the Missouri and upper Mississippi Valleys*

Temperature season	Pressure station and season	Period	Number of years	Multiple correlation coefficient
Winter	Aden—summer Batavia—spring	1889–1929	41	0.582
Do.	Aden—summer Bouzareah—spring	1895–1929	35	.530
Do.	do. Dutch Harbor—autumn	1912–29	18	.566
Do.	Bouzareah—spring Midway—summer	1913–29	17	.595
Do.	Dutch Harbor—autumn Honolulu—summer	1912–29	18	.641
Spring	Bouzareah—winter Markova—summer	1896–1920	25	.588
Do.	do. Lagos—summer	1896–1920	25	.587
Do.	Nome—summer Nome—autumn	1909–29	21	.647
Do.	do. Markova—summer	1909–20	12	.626
Do.	Lagos—summer Nome—summer	1909–29	21	.664
Do.	do. Midway—summer	1913–29	17	.689
Do.	Lagos—summer Midway—summer	1913–29	17	.778
Summer	Rio de Janeiro—autumn Bouzareah—autumn	1895–1929	35	.569
Do.	Rio de Janeiro—autumn Saint Vincent—spring	1895–1929	35	.609
Do.	Rio de Janeiro—autumn Rio de Janeiro—spring	1890–1929	40	.600
Do.	Tokio—winter Rio de Janeiro—autumn	1890–1929	40	.600
Autumn	Moose Factory—summer Nome—spring	1908–29	22	.636
Do.	Moose Factory—summer Markova—winter	1895–1919	25	.672
Do.	Moose Factory—summer South Orkneys—spring	1903–29	27	.630
Do.	do. Nome—spring	1908–29	22	.760

TABLE 2.—*Observed and calculated temperature departures in the Missouri and upper Mississippi Valleys*

Year	Autumn		Winter		Spring		Summer	
	Calculated	Observed	Calculated	Observed	Calculated	Observed	Calculated	Observed
1890							0.4	0.5
1891							−.9	−3.0
1892							−.6	−.5
1893							−2.1	.6
1894							.9	2.3
1895							−.1	−1.0
1896							.1	−.1
1897							1.0	−.4
1898							1.8	.4
1899							1.0	1.1
1900							.5	2.0
1901							2.0	3.8
1902							.8	−1.8
1903							−1.4	−2.1
1904							.1	−2.6
1905							−1.0	−.7
1906							−.2	−1.0
1907							−1.5	−1.1
1908	0.5	1.6					−.4	−1.3
1909	1.4	.8					−.1	.9
1910	−1.0	−.2					−1.6	.2
1911	−3.3	−3.4					.5	1.1
1912	.4	.5	0.9	−4.0			−.6	−1.3
1913	.2	.9	1.8	.5	−0.7	−0.9	2.2	2.7
1914	1.8	2.9	−1.0	2.9	−.2	.4	.1	1.9
1915	−.6	1.8	1.3	−.8	−1.1	−.4	−1.5	−4.5
1916	−.2	−.9	.3	−1.4	−2.6	−.8	.5	1.2
1917	−.1	−1.9	−4.0	−5.0	−.7	−2.8	−2.2	−1.1
1918	.2	−.6	−4.8	−6.2	3.5	2.6	−.4	1.4
1919	−1.9	−2.3	4.3	5.2	−.7	−.2	.8	2.1
1920	1.0	1.8	−1.3	−2.5	−.6	−2.1	−.3	−.3
1921	−.9	.3	.8	6.5	.3	3.1	.9	3.3
1922	2.0	3.4	.8	−.1	2.4	2.0	1.2	1.2
1923	1.4	.7	−.9	.8	−1.2	−2.5	−.2	1.1
1924	−.3	1.1	2.2	2.6	−2.1	−3.2	−.3	−1.9
1925	−.3	−2.5	−2.4	−.7	1.9	3.0	1.7	.9
1926	−2.0	−2.8	1.7	3.7	.1	−.6	.1	−.1
1927	3.0	1.4	1.3	2.2	.7	.7	−1.3	−2.8
1928	−.9	0	−1.6	.8	.2	.4	.5	−1.4
1929	−.8	−2.3	.7	−3.7	.4	1.1	.5	.4

SNOW-GARLANDS

By W. J. HUMPHREYS

Once in a "blue moon" trees and other objects are decorated with snow-garlands—ropes of damp, or re-frozen, snow several feet long, fast at both ends and hanging in catenary loops in between. Snow draperies, that is, pendant sheets and clinging masses of snow, or snow and ice, fast at one end and free at the other, are far more common; they often hang over the eaves of a house when a gentle thaw, especially one supplemented by heating beneath, causes the snow, or snow and under layer of ice, slowly to slide down the roof. A fine example of snow drapery is shown on page 191, volume 118, 1918 of the *Scientific American*.

Snow-garlands, however, as stated are far rarer and more spectacular than snow draperies. Only four brief accounts of them have come to my attention, and they only with the aid of the Weather Bureau's resourceful factician, Mr. C. F. Talman.

The earliest of these is by Hellmann [1] who reports their occurrence the last week of February 1889, on the limbs of trees in the Thiergarten of Berlin, and christens them "snow-garlands." The second is by Assmann [2], and refers to the same occurrence—the one noted by Hellmann. The third, by Kassner [3], describes, with illustrations, snow-garlands that on February 1, 1907, hung from ledges on the wall of a large brick building in Berlin. The fourth, and latest, with illustrations taken at the Central Meteorological Observatory of Japan on January 31, 1925 by S. Ohti, appeared in a Japanese publication; exact reference not known. One of the pictures (there are three) is reproduced in "The Realm of the Air" by C. F. Talman, 1931.

Anyhow, the accounts of this phenomenon appear to be few and far between, so few indeed that the accompanying reproduction of a photograph of an exceptionally fine example of a snow-garland must be of general interest. This picture was taken by Mr. E. P. Gibson (exact date not given), assistant city engineer, East Grand Rapids, Mich., who has kindly authorized its reproduction. He says: "The 'snow rope' was in suspension from two points on the railing slightly over 3 feet apart * * * the festoon was 7 to 8 inches thick in the center, thinning at the points of suspension, and the width at center of span I should estimate at 6 to 7 inches. It formed upon a 4-inch board which was the top of the railing." He also says that during the day or two the garland was sagging and lengthening the temperature held to near the melting point, with alternate brief intervals of thawing and freezing.

Such are the facts of observation. But what is the explanation of this holding of snow crystal to snow crystal in a continuous suspension bridge from anchorage to anchorage? Nothing, we are told, is more impossible than making a rope of sand; and yet of ice sand, that is, of snow crystals, Nature makes suspension bridges, or garlands, if we prefer art to engineering. How does she do it?

The fact that these garlands do not occur when the snow is dry, but only when it is wet, from partial thawing, rules out the suggestion that the snow crystals, or flakes, cling to each other by irregularities on their sides and faces, like so many prickly-burrs. But while one suggested explanation is thus removed another is so strongly supported by the same facts as to compel its acceptance. This is, that the snow crystals, being wet, are strongly drawn each to its adjacent neighbors, by the surface tension of a water film, and thus through film and flake the whole snow-garland tenaciously held together from end to end.

The following experiments are convincing of this: Take a lot of unglazed bits of paper, 1 to 2 millimeters across, and roll them together to the size and shape of a cigarette and try to suspend the collection from its two ends without other support. Immediately it falls apart like the fabled rope of sand. Roll them together again and then put enough water on them to make them wet through and through but not drippy. Now they are held together by the surface tension of water films and will hang nicely in a festoon supported at the two ends only. And as it is with the bits of paper so it is also with snow crystals. They fall apart when dry and cling together when wet.

Obviously a wet, sagging, snow-garland may be subjected to below-freezing temperatures, in which case it then will maintain its shape and position by virtue of the tensile strength of continuous ice, however porous it may be, and not through surface tension as before. In any case the garland is first formed of damp snow whose flakes and particles are held together then, and often for many hours thereafter, by the surface tension of water films.

[1] Met. Zeit, 6, 120, 1889. [2] Das Wetter, 6, 132, 1889. [3] Das Wetter, 24, 141, 1907.

ANALYSES OF RAINS AND SNOWS AT MOUNT VERNON, IOWA, 1934–35

By WILLARD A. KREHL and NICHOLAS KNIGHT

[Cornell College, Mount Vernon, Iowa, June 1935]

During the past several months we have continued the analyses of rains and snows at Mount Vernon, Iowa, which have been made in the Cornell College chemical laboratories for about 25 years. Efforts have been made to secure accurate and trustworthy results.

Specimen 7, November 20, 1934, was precipitated during heavy thunder and lightning. Specimen 11, November 28, came after the wind had been in the east for a number of days, and we found a rather unusual quantity of NaCl.

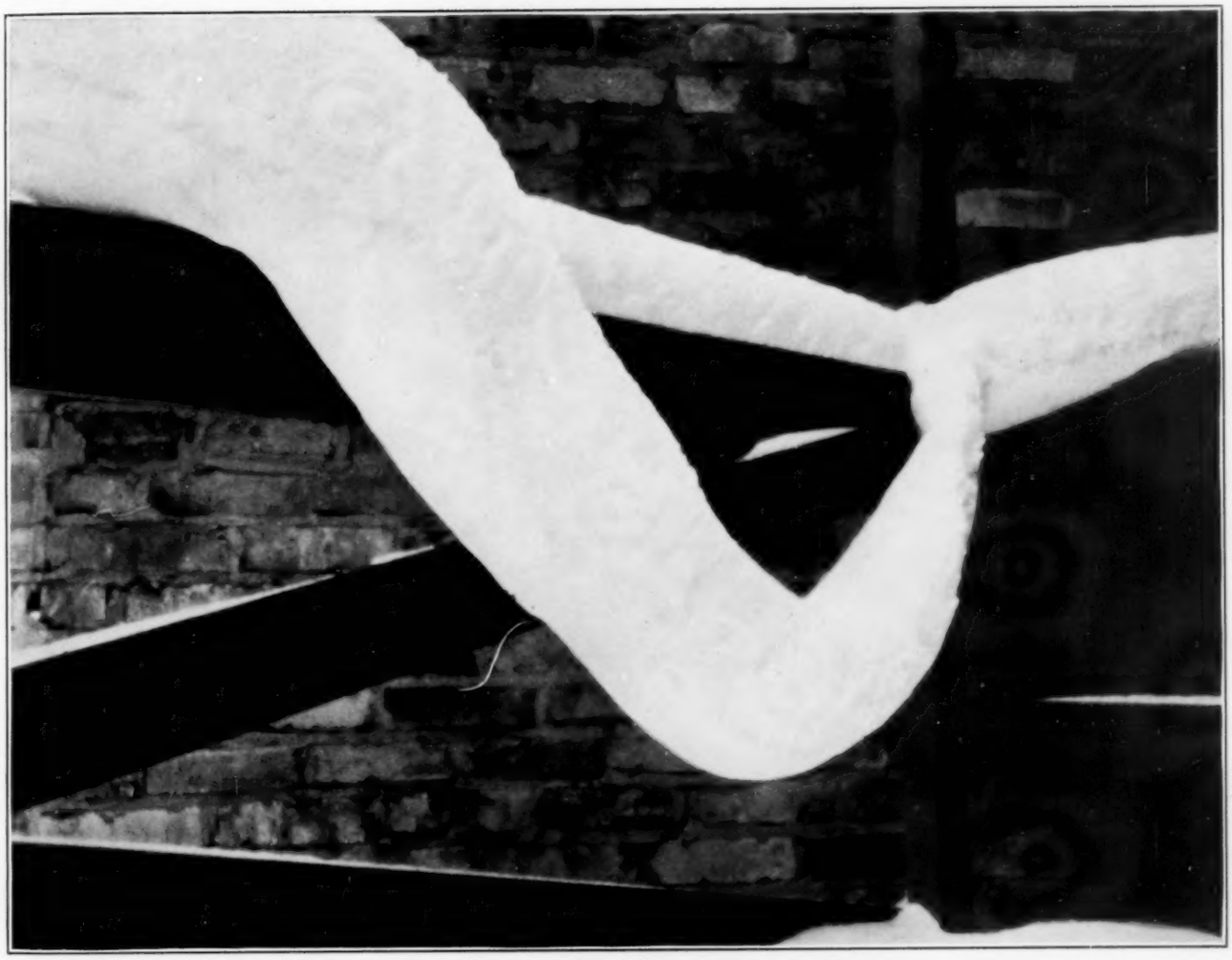
During a considerable period, precipitation occurred at frequent intervals, and our results show how frequent storms purify the air.

In specimen 17, the sulphate was unusually high, as the snow fell during a period of extreme cold and the people were burning considerable coal for fuel. We believe that burning coal, and in some cases dust storms, are the main sources of sulphate in the air.

The newspapers contained numerous reports of a severe dust storm on March 16, about the time specimen 30 was precipitated. The analysis indicates that the dust did not reach this locality. The analyses usually show the effect of dust storms. The first thunder and lightning of the season occurred during the precipitation of specimen 31 on March 24.

Much dust collected in the pans at the time of the storm on May 1, 1935. Heavy thunder and lightning accompanied a portion of this storm.

Altogether, we analyzed 40 specimens—28 of rain, and 12 of snow.



Snow-garland (E. P. Gibson).

UNIV. OF MICH.

TABLE 1.—*Parts per million*

Specimen	Date, 1934-35	Depth of rain or snow	Chlorine	Free ammonia	Alf. ammonia	N in nitrate	N in nitrite	Sulphate, SO_3
		Inches						
1	June 23	[1] 0.2	2.13	0.04	0.32	0.8	0.00	0.00
2	June 25	.4	2.84	.04	.11	.6	.00	.00
3	Sept. 28	[1] .12	3.55	.72	.28	.4	.01	.00
4	Oct. 20	1.2	3.55	.36	.24	.7	.02	.016
5	Nov. 3	1.75	3.55	.16	.20	.1	.02	.00
6	Nov. 18	1.15	1.42	.08	.03	.13	.00	.013
7	Nov. 20	1.00	2.13	.16	.112	.10	.02	.009
8	Nov. 22	.95	1.42	.08	.20	.084	.031	.009
9	Nov. 22	[1] .08	4.97	.272	.48	.47	.033	.009
10	Nov. 26	[1] .20	2.13	.04	.72	.10	.019	.011
11	Nov. 28	[1] 1.00	7.10	.02	.16	.10	.014	.007
12	Nov. 30	[1] 1.00 [2] .5	2.13	.04	.20	.00	.003	.0009
13	Dec. 3	[1] 4.00	1.42	.00	.20	.05	.006	.0005
14	Dec. 6	[2] 4.00	1.42	.08	.56	.03	.012	.0085
15	Dec. 19	[2] 2.00	2.84	.24	.40	.0105	.01	.005
16	Dec. 26	[2] 2.00	.00	.56	.80	.117	.029	.022
17	Jan. 9	[1] .4	3.6	.112	.72	.05	.012	.0103
18	Jan. 10	[2] 2.00	2.13	.056	.76	.11	.015	.009
19	Jan. 12	.35	2.13	.112	.48	.09	.02	.005
20	Jan. 16	[1] .75	2.13	.28	.28	.015	.00	.010
21	Jan. 19	[1] .25	2.84	.04	.56	.100	.002	.026
22	Jan. 20	[2] 3.00	4.97	.056	.24	.200	.003	.005
23	Feb. 8	[2] 3.00	2.13	.32	.04	.110	.002	.007
24	Feb. 15	[1] .4	4.97	.112	.72	.10	.061	.12
25	Feb. 22	[2] 2.00	2.13	.28	.72	.120	.00	.015
26	Feb. 25	[2] 4.00	2.84	.28	.136	.05	.00	.014
27	Mar. 4	[1] .33	3.55	.20	.56	.085	.015	.00
28	Mar. 7	[1] 4.00	3.55	.36	.36	.05	.00	.024
29	Mar. 10	[1] .25	2.13	.04	.72	.05	.015	.0103
30	Mar. 16	[2] 2.00	3.55	.136	.112	.02	.004	.00
31	Mar. 24	[1] .25	4.20	.02	1.98	.2	.028	.14
32	Mar. 27	[2] 3.00	2.84	.16	.32	.0475	.0075	.007
33	Apr. 11	[1] 1.5	3.55	.20	.36	.05	.008	.009
34	Apr. 22	[1] .4	3.55	.96	.24	.09	.03	.015
35	May 1	[1] 1.1	3.55	.56	.20	.10	1.35	.00
36	May 3	[1] .9	2.13	.16	.056	.045	.009	.00
37	May 13	[1] .55	4.26	.40	.112	.05	.01	.009
38	May 19	[1] .45	5.68	.28	.112	.105	.017	.0086
39	May 28	[1] 2.75	3.55	.08	.04	.10	.005	.007
40	June 2	[1] 1.00	3.55	.112	.056	.10	.005	.00

[1] Rain. [2] Snow.

TABLE 2.—*Pounds per acre*

Specimen	Date, 1934-35	Depth of rain or snow	Chlorine	Free ammonia	Alf. ammonia	N in nitrate	N in nitrite	Sulphate, SO_3
		Inches						
1	June 23	[1] 0.2	0.096	0.0019	0.0144	0.036	0.00	0.00
2	June 25	[1] .4	.26	.0036	.0099	.0054	.00	.00
3	Sept. 28	[1] .12	.096	.02	.0075	.011	.0003	.00
4	Oct. 20	[1] 1.2	.97	.098	.065	.19	.005	.0044
5	Nov. 3	[1] 1.75	1.29	.06	.078	.04	.008	.00
6	Nov. 18	1.15	.37	.02	.008	.034	.00	.0034
7	Nov. 20	1.00	.50	.04	.026	.02	.005	.002
8	Nov. 22	.95	.31	.02	.043	.02	.007	.002
9	Nov. 22	[1] .08	.09	.006	.009	.042	----------	.002
10	Nov. 26	[1] .20	.095	.0018	.032	.0045	.0009	.0025
11	Nov. 28	[1] 1	1.61	.0045	.036	.044	.032	.0016
12	Nov. 30	[1] 1.5	.72	.0136	.068	.00	.001	.0031
13	Dec. 3	[2] 6.4	.13	.006	.018	.0045	.0005	.0005
14	Dec. 6	[2] 4	.11	.006	.043	.0009	----------	.0006
15	Dec. 19	[2] 2	.11	.009	.015	.0004	.0004	.0002
16	Dec. 26	[2] 2	.00	.0213	.0304	.0196	.0011	.0008
17	Jan. 9	[1] .4	.33	.012	.0655	.0045	.0011	.0009
18	Jan. 10	[2] 2	.082	.002	.029	.004	.0006	.0003
19	Jan. 12	[1] .35	.17	.009	.038	.0072	.0016	.0004
20	Jan. 16	[1] .75	.36	.048	.048	.0026	.00	.0017
21	Jan. 19	[1] .25	.162	.0023	.032	.0057	.00011	.0015
22	Jan. 20	[2] 3	.283	.003	.014	.0114	.00015	.0003
23	Feb. 8	[2] 3	.125	.019	.0024	.0065	.0014	.0004
24	Feb. 15	[1] .4	.45	.0102	.0655	.0090	.0055	.0011
25	Feb. 22	[2] 2	.081	.011	.027	.0045	.00	.0057
26	Feb. 25	[2] 4	.22	.021	.0106	.004	.00	.0011
27	Mar. 4	[1] .33	.27	.015	.043	.0064	.0011	.00
28	Mar. 7	[2] 4	.202	.021	.21	.0028	.00	.0018
29	Mar. 10	[1] .25	.121	.0022	.041	.003	.0009	.0006
30	Mar. 16	[2] 2	.135	.005	.0042	.0007	.0002	.00
31	Mar. 24	[1] .25	.243	.0409	.112	.0104	.0016	.008
32	Mar. 27	[1] .3	.162	.0091	.018	.0027	.0004	.0004
33	Apr. 11	[1] 1.5	1.207	.068	.1088	.017	.0027	.0031
34	Apr. 22	[1] .4	.390	.1005	.026	.01	.0033	.0017
35	May 1	[1] 1.1	.9	.14	.05	.025	.34	.00
36	May 3	[1] .9	.43	.032	.0112	.009	.0018	.00
37	May 13	[1] .55	.53	.05	.014	.0063	.0013	.001
38	May 19	[1] .45	.568	.028	.0112	.0105	.0017	.00086
39	May 28	[1] 2.75	1.86	.042	.02	.052	.0025	.00037
40	June 2	[1] 1	.816	.0257	.0124	.023	.00115	.00

[1] Rain. [2] Snow.

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SOLAR OBSERVATIONS

SOLAR RADIATION MEASUREMENTS DURING MAY 1935

By IRVING F. HAND, *Assistant in Solar Radiation Investigations*

For a description of instruments employed and their exposures, the reader is referred to the January 1935 REVIEW, page 24.

Beginning with this issue summaries of total solar and sky radiation values obtained at San Juan, Puerto Rico (lat. 18° 28′ N., long. 66° 06′ W.) will be included in table 2.

Table 1 shows that solar radiation intensities averaged above normal at all three Weather Bureau stations.

Table 2 shows an excess in total solar and sky radiation at all stations except Washington, Madison, Lincoln, Twin Falls, and Riverside. The depletion in radiation at the first three named stations is due in large part to dust storms; Lincoln, Nebr., shows the greatest departure from normal ever recorded for that station.

Polarization measurements obtained on 4 days at Washington give a mean of 60 percent with a maximum of 63 percent on the 18th. At Madison observations made on 5 days give a mean of 59 percent with a maximum of 70 percent on the 24th. All of these values are above the May normals for the two stations.

TABLE 1.—*Solar radiation intensities during May 1935*

[Gram-calories per minute per square centimeter of normal surface]

WASHINGTON, D. C.

Date	Sun's zenith distance										
	8 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass									Local mean solar time
		A. M.					P. M.				
	e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e
	mm	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm*
Mar. 1	3.81				1.20						3.99
May 8	5.56			1.01	1.21	1.42					6.27
May 18	4.37	0.81	0.89	1.05	1.26	1.42					3.99
May 22	3.81	.59	.78	.92	1.15	1.41					4.57
May 25	6.76				.75	1.27					5.36
May 27	9.47				.92	1.35					9.47
May 28	9.83				.81	1.25					11.38
May 29	11.38					1.27					
Means		(.70)	(.84)	.99	1.04	1.34					
Departures		+.07	+.13	+.16	+.04	+.08					

* Extrapolated.

TABLE 1.—*Solar radiation intensities during May 1935*—Contd.

MADISON, WIS.

Date	Sun's zenith distance: 8 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e
	mm	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm*
May 9	8.18					1.45					5.79
May 10	5.79	0.88	0.97	1.08	1.25	1.51					5.36
May 17	5.16		.97	1.11	1.26		1.20				5.56
May 18	6.76				1.20						4.95
May 21	7.04					1.39					6.76
May 23	4.95		1.00	1.11	1.24	1.47					5.56
May 24	6.27	.85	.95	1.10	1.14	1.43					5.56
May 25	7.29	.76	.88	1.02	1.22	1.49					5.56
May 31	9.14		.81	.97	1.19						8.48
Means		0.83	0.93	1.06	1.21	1.46	(1.20)				
Departures		+.03	+.11	+.04	+.10	+.09	+.16				

LINCOLN, NEBR.

May 6	7.29								0.70	0.53	7.32
May 9	6.02	0.71	0.77	0.84	1.30	1.48	1.25	1.04			4.95
May 21	7.29		.68	.92	1.17	1.38					8.48
May 24	6.76	.80	.93	.99	1.25	1.47					6.50
Means		(.76)	.79	.92	1.24	1.44	(1.25)	(1.04)	(.70)	(.53)	
Departures		+.10	+.01	−.01	+.12	+.06	+.15	+.14	−.11	−.15	

TABLE 1.—*Solar radiation intensities during May 1935*—Contd.

BLUE HILL, MASS.

Date	Sun's zenith distance: 8 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e
	mm	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm*
May 1	3.3			1.07	1.24	1.45	1.20	1.02			2.9
May 4	5.6					1.44	1.16	.90			4.0
May 5	5.4			1.03	1.21	1.44					3.2
May 6	7.1					1.35					6.3
May 8	6.1					1.43	1.12				5.2
May 9	6.1		0.95	1.05	1.15	1.39	1.04	.81			4.8
May 11	5.8		1.00	1.13	1.29	1.50	1.21	.94			3.6
May 12	4.6					1.43					4.6
May 13	7.4	0.84	.91	1.06	1.21	1.35					4.8
May 15	4.2			1.13	1.35	1.51	1.16	.94			2.8
May 16	4.6			1.06	1.27	1.48					4.6
May 17	6.5				1.18	1.40					6.8
May 18	4.6		1.09	1.21	1.35	1.42					3.3
May 19	3.6			1.20	1.35	1.48					4.0
May 20	5.0		1.09	1.19	1.31	1.38					5.0
May 22	5.2			1.07	1.29	1.48	1.13	.71	0.58		3.8
May 23	5.2					1.43	1.14	.93			6.1
May 24	4.8			1.17	1.26	1.43					3.6
May 25	5.8			1.10	1.23	1.41					4.4
May 26	5.8		.95	1.07	1.24	1.43	1.12	.89	.74		4.8
May 27	7.4			1.01	1.18	1.33					7.1
May 29	12.3					1.20					13.2
May 30	12.8		.93	1.07							9.2
May 31	11.5					1.35					11.1
Averages		.84	.99	1.10	1.26	1.41	1.14	.90	.66		

TABLE 2.—*Average daily totals of solar radiation (direct+diffuse) received on a horizontal surface*

Week beginning—	Gram-calories per square centimeter: Washington	Madison	Lincoln	Chicago	New York	Fresno	Fairbanks	Twin Falls	Miami	New Orleans	Riverside	Blue Hill	Mount Washington	Friday Harbor	Ithaca	San Juan
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Apr. 30	322	319	406	252	310	690	392	561	541	343	531	484		584	206	
May 7	421	430	334	482	475	691	571	632	507	388	418	543		648	512	
May 14	464	467	147	485	579	698	485	575	557	461	525	591		585	606	588
May 21	490	516	367	532	552	677	401	638	467	464	584	627		614	653	673
May 28	484	433	352	420	518	675	418	551	588	385	555	588		625	464	560
	Departures from weekly normals															
Apr. 30	−130	−123	−68	−123	−77	+73	−4	+36	+15	+8	−7					
May 7	−21	−13	−116	+106	+98	+59	+92	+48	−23	+27	−106					
May 14	−3	−10	−370	+67	+169	+43	+37	−50	+56	+95	−13					
May 21	−10	+24	−186	+78	+125	+9	−44	−7	−39	+68	+12					
May 28	−33	−62	−159	−30	+74	−8	−19	−45	+103	−94	−5					
	Accumulated departures on June 3, 1935															
	−2,912	−5,733	−7,280	+1,575	+4,291	+301	+1,841	−728	−238	−294	−3,724					

TABLE 3.—*Total I_m, and screened, I_p, I_r, solar radiation intensity measurements, obtained during May 1935, and determinations of the atmospheric turbidity factor, β, and water-vapor content, w=depth in millimeters, if precipitated*

AMERICAN UNIVERSITY, WASHINGTON, D. C.

Date and hour angle	Solar altitude	Air mass	I_m	I_p	I_r	$\beta_{I_{m-r}}$	$\beta_{I_{p-r}}$	β_{mean}	$\frac{I_{w-o}}{1.94}$ (Percentage of solar constant)	$\frac{I_{w-o}-I_m}{1.94}$ (Percentage of solar constant)	w	Air-mass type
May 22, 1935	° ′	*m*	*gr. cal.*	*gr. cal.*	*gr. cal.*						*mm*	
4:39 a. m.	28 04	2.12	1.132	0.825	0.664	0.067	0.087	0.077	67.1	7.3	6.0	Pc, Npc aloft
4:35 a. m.	28 50	2.07	1.138	.827	.666	.067	.064	.066	70.6	10.5	6.8	
May 25												
4:23 a. m.	31 23	1.92	1.050	.815	.655	.118	.074	.096	66.0	10.5	7.0	Npc
4:13 a. m.	33 42	1.80	1.091	.815	.655	.102	.080	.091	68.0	10.4	7.4	
May 27												
0:49 a. m.	69 20	1.07	1.240	.840	.647	.078	.072	.075	80.3	19.7	13.6	Npc
0:29 a. m.	71 24	1.05	1.249	.840	.649	.070	.078	.074	80.8	19.8	13.9	
May 28												
1:36 p. m.	62 59	1.12	1.118	.785	.596	.110	.076	.093	77.4	18.1	13.0	Npc, T_M
1:41 p. m.	62 12	1.13	1.123	.781	.598	.110	.086	.098	76.7	17.2	12.8	Approaching aloft
May 31												
1:47 p. m.	61 20	1.14	1.134	.830	.670	.171	.145	.156	69.3	9.1	11.7	Npc
1:57 p. m.	61 00	1.14	1.183	.832	.672	.162	.145	.154	69.4	8.4	11.4	

Atmospheric conditions:
May 22. Temperature, 16° C.; wind, NW. 16; visibility, 20 miles; polarization, 60 percent.
May 25. Temperature, 14° C.; wind, NW 10.
May 27. Temperature, 21° C.; wind, 12 S.
May 28. Temperature, 22° C.; wind, 12 SW.
May 31. Temperature, 21° C.; wind, 12 N.

BLUE HILL METEOROLOGICAL OBSERVATORY OF HARVARD UNIVERSITY

May 1, 1935												
0:17 a. m.	62 35	1.12	1.433	0.988	0.768	0.041	0.023	0.032	85.6	10.6	12.5	Pc; T_M aloft
2:32 p. m.	47 30	1.35	1.372	.946	.761	.048	.047	.048	81.0	9.2	10.2	
2:51 p. m.	44 18	1.43	1.354	.934	.756	.050	.083	.066	78.2	7.3	9.3	Pc
May 5												
4:35 a. m.	26 24	2.26	1.151	.815	.677	.052	.097	.074	72.1	11.4	6.3	NPc
May 6												
1:23 p. m.	58 40	1.17	1.279	.902	.706	.088	.060	.074	79.2	12.1	12.2	NPc-NP_A; T_C aloft
May 8												
2:50 p. m.	45 55	1.41	1.329	.904	.729	.047	.082	.064	77.2	7.5	9.5	NPc-P_A
May 9												
4:03 a. m.	33 10	1.83	1.180	.825	.678	.067	.106	.086	68.9	6.9	7.3	NPc
1:59 a. m.	54 30	1.23	1.365	.925	.740	.048	.075	.062	74.4	2.7	8.6	
0:09 p. m.	64 57	1.10	1.375	.932	.748	.067	.098	.082	77.8	5.6	11.5	
5:00 p. m.	22 29	2.60	0.875	.678	.552	.106	.95	.100	58.2	12.2	5.5	NPc-NP_A
May 11												
2:59 a. m.	44 54	1.41	1.405	.950	.765	.027	.067	.047	79.5	5.6	9.3	Pc
0:51 a. m.	63 14	1.12	1.475	.990	.788	.024	.054	.039	84.8	7.2	11.8	
0:06 p. m.	65 31	1.09	1.468	.978	.775	.020	.052	.036	85.4	8.2	12.4	
1:37 p. m.	58 00	1.18	1.398	.950	.755	.056	.062	.059	82.4	8.4	10.8	
May 12												
2:06 a. m.	53 57	1.24	1.435	.975	.785	.042	.097	.067	79.2	3.7	9.2	Pc-P_A
0:40 a. m.	60 21	1.15	1.430	.970	.780	.045	.079	.062	81.3	6.1	11.1	
May 13												
0:26 a. m.	65 25	1.10	1.345	.890	.708	.050	.100	.075	80.0	9.2	12.5	NPc
May 15												
4:39 a. m.	27 18	2.17	1.305	.920	.755	.029	.058	.044	76.6	8.5	6.2	
3:00 a. m.	45 23	1.40	1.440	------	.800	.029	------	.029	83.8	7.9	9.6	Pc
0:37 a. m.	65 26	1.10	1.492	1.010	.802	.024	.031	.028	86.6	8.0	12.2	
3:02 p. m.	45.02	1 41	1.361	.953	.755	.067	.045	.056	79.0	7.3	9.4	
May 16												
3:21 a. m.	41 48	1.50	1.376	.931	.759	.032	.070	.051	79.2	6.7	8.7	Pc
0:45 a. m.	64 54	1.10	1.463	.979	.787	.030	.077	.054	82.7	5.6	11.4	
0:31 a. m.	65 53	1.09	1.453	.982	.782	.034	.037	.036	85.4	8.9	12.5	
May 18												
4:07 a. m.	33 37	1.80	1.334	.923	.741	.023	.049	.036	80.8	10.4	7.8	Pc
May 20												
1:43 a. m.	58 52	1.17	1.375	.956	.762	.067	.067	.067	80.2	7.6	11.7	Pc
May 22												
4:31 a. m.	29 44	2.01	1.185	.840	.680	.042	.047	.044	75.5	12.9	7.1	
3:07 a. m.	45 10	1.41	1.390	.925	.743	.021	.068	.044	81.1	7.6	9.5	Pc
1:34 a.m.	60 28	1.15	1.415	.975	.780	.050	.064	.057	82.0	7.3	11.4	
May 23												
1:23 p. m.	62 08	1.13	1.400	.960	.783	.080	.106	.093	77.6	3.6	10.0	Pc
5:03 p. m.	23 57	2.55	1.030	.763	.630	.073	.083	.078	63.1	8.7	5.3	
May 24												
4:08 a. m.	34 17	1.77	1.285	.900	.725	.047	.057	.052	76.0	8.1	8.6	
3:28 a. m.	41 39	1.50	1.365	.952	.762	.039	.066	.052	78.7	6.5	8.7	Pc
3:09 a. m.	45 05	1.41	1.370	.952	.762	.044	.062	.053	79.4	7.0	9.4	
May 25												
3:54 a. m.	36 55	1.66	1.290	.886	.712	.038	.069	.054	76.5	8.3	8.1	
3:09 a. m.	45 10	1.40	1.305	.904	.725	.058	.075	.066	76.9	7.9	9.9	Pc
1:24 a. m.	68 04	1.08	1.368	.935	.748	.066	.100	.083	79.0	6.7	12.1	

TABLE 3.—*Total, I_m, and screened, I_y, I_r, solar radiation intensity measurements, obtained during May 1935, and determinations of the atmospheric turbidity factor, β, and water-vapor content, w=depth in millimeters, if precipitated*—Continued

Date and hour angle	Solar altitude	Air mass	I_m	I_y	I_r	β_{I_m-r}	β_{I_y-r}	$\beta_{m+.28}$	$\frac{I_{y-r}}{1.94}$ (Percentage of solar constant)	$\frac{I_{y-r}-I_m}{1.94}$ (Percentage of solar constant)	w	Air-mass type
May 26	° ′	*m*	*gr. cal.*	*gr. cal.*	*gr. cal.*						*mm*	
5:08 a. m.	23 20	2.52	1.139	.832	.681	.048	.062	.055	68.3	8.0	5.3	NPc
3:54 a. m.	37 01	1.66	1.318	.916	.739	.046	.062	.054	76.4	6.7	7.9	
1:46 a. m.	58 14	1.18	1.417	.964	.769	.039	.062	.050	82.4	7.5	11.0	
0:36 a. m.	67 32	1.08	1.407	.959	.762	.050	.054	.052	83.3	8.9	12.6	NPc
0:18 a. m.	68 26	1.08	1.419	.962	.777	.053	.069	.061	82.0	6.8	11.1	
2:44 p. m.	40 44	1.31	1.328	.928	.740	.058	.070	.064	81.6	11.3	10.8	
May 27												
3:22 a. m.	43 00	1.46	1.278	.901	.723	.056	.075	.066	74.5	6.9	9.3	NPc
1:05 a. m.	65 03	1.10	1.308	.913	.729	.110	.128	.119	74.8	5.6	11.5	
May 29												
2:00 a. m.	57 15	1.19	1.193	.752	.612	.066	.198	.132	70.3	7.1	11.1	To
May 31												
1:26 p. m.	63 23	1.12	1.328	.902	.710	.059	.074	.066	78.7	8.2	12.0	NPc; T_A aloft

Atmospheric conditions during solar radiation measurements. Blue Hill Observatory of Harvard University

Date and time from apparent noon	Air temperature	Wind Beaufort scale	Visibility (scale 0–10)	Sky blueness	Cloudiness and remarks
May 1935	°C.				
1; 0:27 a. m.	7.8	W 8	8–9	9	5 Cu, Frcu, no haze.
1; 2:34 p. m.	8.9	W 9	8–9	10	Few Ci, 2 Cu, light haze, pyrh. vibrating.
8; 0:42 p. m.	11.7	NW 1	8–9	9	B Cu, Stcu, light haze.
8; 2:34 p. m.	13.3	NW 4	8–9	10	3 Cu.
9; 2:28 a. m.	17.8	S 1	8–9	8	2 Cu.
9; 0:27 a. m.	18.9	SSE 2	8–9	8	Few Cu, light haze.
11; 3:29 a. m.	12.8	W 5	9	12	Few Acu, few Cu, no haze.
11; 0:22 a. m.	16.1	NW 6	9	11	Few Cu, no haze.
11; 2:32 p. m.	18.3	W 5	9	9	2 Cu, no haze.
12; 2:14 a. m.	10.7	NW 4	9	(T)4	2 Ci.
15; 5:06 a. m.	6.7	NW 5	9	10	Few Ci, few Cu, no haze, gusty.
15; 3:32 a. m.	7.2	NW 5	9	10	Few Ci, few Cu, no haze, very gusty.
15; 0:46 a. m.	10.6	NW 5	9–10	10	Few Cu, no haze, very gusty.
15; 2:31 p. m.	13.3	NW 4	9–10	11	1 Cu, no haze, gusty.
16; 3:31 a. m.	9.4	NW 3	9	11	Few Cist, light haze.
16; 0:51 a. m.	12.8	WNW 2	9	9	1 Ci, coming up fast, no haze.
17; 1:02 p. m.	13.9	NE 3	8	9	Few Ci, 5 Acu, 2 Cu, light haze.
18; 3:42 a. m.	10.0	NNW 3	9	11	Few Ci, 1 Cu, increasing, mod. smoke to N.
19; 4:16 a. m.	7.8	NW 5	9–10	9	Few Acu, 4 Cu, no haze.
19; 2:29 p. m.	13.3	WNW 6	9	9	5 Cu, Stcu, no haze.
20; 3:34 a. m.	11.1	W 5	8	8	Few Acu, 1 Cu, light haze.
20; 2:53 p. m.	17.2	WNW 6	8	8	3 Acu, 2 Cu, light haze, Cu very close.
22; 3:35 a. m.	11.1	NW 4	8–9	9	Few Acu, few Cu, light haze.
22; 0:53 a. m.	15.0	W 3 var.	8	8	Few Ci, 4 Cu, light haze.
22; 1:51 p. m.	16.7	W 3	9	9	Few Ci, 5 Cu, light haze.
23; 1:06 p. m.	11.1	SE 3	8	9	1 Acu, 6 Cu.
24; 3:37 a. m.	10.0	NW 4	8	11	Few Cu, light haze.
24; 0:47 a. m.	14.4	W 3	8–9	8	7 Cu, light water haze.
25; 4:40 a. m.	16.1	NW 3	7–8	11	4 Acu, light haze.
25; 0:56 a. m.	18.9	W 2 var.	8–9	------	Few Acu, 5 Cu.
26; 4:21 a. m.	15.6	NNE 3	8	11	0 clouds, inversion.
26; 0:45 a. m.	19.4	NE 1–2	9	9	0 clouds, light smoke N.
26; 2:25 p. m.	22.2	Var. 2	9	8	0 clouds, light haze.
27; 3:31 a. m.	22.2	SW 3	8	9	Few Ci, light haze.
27; 0:49 a. m.	26.1	W 3 var.	8	7	2 Cu, light haze.
31; 1:09 p. m.	16.7	E 4	8	8	2 Ci, few Cu, light haze, inversion, smoke E.
31; 2:22 p. m.	17.8	NE 3	8	9	3 Ci, 2 Acu, 1 Cu, inversion, fog at sea.

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, U. S. Navy, Superintendent U. S. Naval Observatory. Data furnished by the U. S. Naval Observatory in cooperation with Harvard and Mount Wilson Observatories. The difference in longitude is measured from the central meridian, positive west. The north latitude is positive. Areas are corrected for foreshortening and are expressed in millionths of the sun's visible hemisphere. The total area for each day includes spots and groups]

Date	Eastern standard time	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot	Area: Group	Total area for each day	Observatory
1935	h m	°	°	°				
May 1	13 32	−53.5	315.1	+21.0	108	------	------	U. S. Naval.
		−41.0	327.6	−22.0	31	------	139	
May 2	13 49	−40.0	315.2	+21.0	62	------	------	Do.
		−28.0	327.2	−25.0	15	------	------	
		−20.0	335.2	−31.0	15	------	92	

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot	Area: Group	Total area for each day	Observatory
1935	h m	°	°	°				
May 3	12 15	−48.0	294.9	−21.0	------	10	------	Mt. Wilson.
		−28.0	314.9	+21.0	94	------	------	
		−15.0	327.9	−25.0	------	6	------	
		−9.0	333.9	−31.0	------	85	195	
May 4	9 15	−80.0	251.4	−27.0	40	------	------	Do.
		−15.0	316.4	+21.0	83	------	------	
		+5.0	336.4	−31.0	------	233	356	
May 6	12 15	−60.0	243.2	−27.0	217	------	------	Do.
		−29.0	274.2	+21.0	8	------	------	
		−6.0	297.2	−21.0	------	7	------	
		+11.0	314.2	+21.0	202	------	------	
		+30.0	333.2	−30.0	------	660	1094	
May 7	14 56	−50.0	238.5	−20.0	------	100	------	U. S. Naval.
		−49.0	239.5	−28.5	154	------	------	
		+25.5	314.0	+24.0	39	------	------	
		+44.0	332.5	−30.0	------	401	694	
May 8	10 46	−37.0	240.6	−20.0	------	216	------	Do.
		−36.5	241.1	−28.5	185	------	------	
		+37.0	314.6	+24.0	31	------	------	
		+55.0	332.6	−29.5	------	278	710	
May 9	13 18	−27.0	236.0	−20.0	------	139	------	Do.
		−22.5	240.5	−28.5	123	------	------	
		−19.5	243.5	−21.0	------	93	------	
		+70.0	333.0	−29.5	------	216	371	
May 10	13 14	−13.0	236.8	−20.0	------	123	------	Do.
		−9.5	240.3	−28.0	123	------	------	
		−5.0	244.8	−20.5	------	93	------	
		+76.0	325.8	−29.0	123	------	462	
May 11	11 20	−67.0	170.6	+29.5	15	------	------	Do.
		−0.5	237.1	−20.0	------	108	------	
		+2.5	240.1	−28.0	123	------	------	
		+7.0	244.6	−20.5	------	77	323	
May 12	11 15	−53.5	170.9	+29.5	23	------	------	Do.
		+12.5	236.9	−20.0	------	77	------	
		+16.0	240.4	−28.5	93	------	------	
		+21.0	245.4	−20.0	------	62	255	
May 13	14 55	−40.0	169.2	+29.0	------	31	------	Do.
		−27.0	182.2	−20.0	------	46	------	
		+29.0	238.2	−20.0	39	------	------	
		+30.0	239.2	−28.0	123	------	------	
		+36.5	245.7	−20.0	46	------	285	
May 14	13 20	−27.0	169.9	+28.0	------	7	------	Mount Wilson.
		−15.0	181.9	−21.0	------	8	------	
		+44.0	240.9	−28.0	163	------	------	
		+45.0	241.9	+30.0	1	------	------	
		+49.0	245.9	−20.0	------	109	288	
May 15	11 38	−12.0	172.6	+28.0	15	------	------	U. S. Naval.
		+54.0	238.6	−27.5	123	------	------	
		+60.0	244.6	−20.0	46	------	184	
May 17	10 52	+79.0	237.5	−27.5	39	------	39	Do.
May 18	11 11	No spots			------	------	------	Do.
May 19	11 34	No spots			------	------	------	Do.
May 20	9 10	No spots			------	------	------	Mount Wilson.
May 21	11 19	No spots			------	------	------	U. S. Naval.
May 22	11 21	No spots			------	------	------	Do.
May 23	9 0	No spots			------	------	------	Mount Wilson.
May 24	9 20	−13.0	53.8	−20.0	------	14	------	Do.
		+61.0	127.8	+4.0	7	------	21	
May 25	10 58	No spots			------	------	------	U. S. Naval.
May 26	11 59	−80.0	318.8	−30.0	62	------	62	Do.
May 27	11 11	−71.0	315.0	−29.5	108	------	108	Do.
May 28	13 13	−57.0	314.7	−29.5	154	------	154	Do.

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Heliographic			Area		Total area for each day	Observatory
		Diff. in longitude	Longitude	Latitude	Spot	Group		
May 29	11 20	−80.0	279.5	+26.5	46			U. S. Naval.
		−60.0	299.5	+17.0	46			
		−47.0	312.5	−29.5		93	185	
May 30	9 20	−70.0	277.5	+27.0	57			Mount Wilson.
		−48.0	299.5	+17.0		21		
		−33.0	314.5	−27.0	157		235	
May 31	13 14	−56.0	276.0	+26.5		116		U. S. Naval.
		−19.0	313.0	−30.0		154	270	

Mean daily area for 29 days, 232.

PROVISIONAL SUN-SPOT RELATIVE NUMBERS, MAY 1935

(Dependent alone on observations at Zurich and its station at Arosa)

[Data furnished through the courtesy of Prof. W. Brunner, Eidgen. Sternwarte, Zurich, Switzerland]

May 1935	Relative numbers	May 1935	Relative numbers	May 1935	Relative numbers
1	17	11	*aa* 46	21	0
2	26	12	41	22	0
3	*Mc* 46	13	41	23	0
4	*b* 56	14	49	24	17
5	*de* 56	15	32	25	7?
6	56	16		26	*d* 8
7	*Ec* 56	17	8	27	8
8	62	18	0	28	8
9	54	19	0	29	*d* 17
10	41	20	0	30	30
				31	38

Mean, 30 days=27.3.

a=Passage of an average-sized group through the central meridian.
b=Passage of a large group or spot through the central meridian.
c=New formation of a center of activity: *E*, on the eastern part of the sun's disk; *W*, on the western part; *M*, in the central zone.
d=Entrance of a large or average-sized center of activity on the east limb.

AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. Little, in Charge]

By L. T. SAMUELS

At those stations with a sufficient period of record for the determination of approximate normals, free-air temperatures during May averaged below normal, except at Pensacola and in the higher levels at Sunnyvale and San Diego. (See table 1.) As during April, mean free-air temperatures for May at Seattle and Spokane were higher than those at Boston at and below the 3,000-meter level, but above this level the temperatures at Boston were increasingly the higher.

Free-air relative humidities averaged slightly above normal at most stations, with the largest departures at Omaha. The free-air relative humidities averaged highest over the northern Plateau region.

The resultant winds for the month were in general as follows (see table 2): At the 1,000-meter level the directions contained a greater northerly component than normal over the northeastern section and Lake region, with velocities mostly below normal; elsewhere the directions were mostly close to normal, with velocities preponderantly above normal over the southeastern section. At the 4,000-meter level the directions were generally close to normal, with a slight excess of northerly components at most of the northern stations and on the Pacific coast; velocities were mostly above normal.

TABLE 1.—*Mean free-air temperatures and relative humidities obtained by airplanes during May 1935*

TEMPERATURE (° C.)

Stations	Altitude (meters) m. s. l.																		Number of observations
	Surface		500		1,000		1,500		2,000		2,500		3,000		4,000		5,000		
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	
Billings, Mont.[1] (1,088 m)	6.7						7.9		5.6		2.0		−1.6		−8.2		−15.0		31
Boston, Mass.[2] (6 m)	9.4	−4.1	7.5	−3.9	4.5	−4.5	1.6	−4.7	−0.5	−4.5	−2.3	−4.1	−4.4	−3.6	−8.9	−2.9	−14.8	−2.7	15
Cheyenne, Wyo.[1] (1,873 m)	4.1						3.8		2.2		−0.4		−6.7		−13.4				29
Fargo, N. Dak.[1] (274 m)	5.8		8.9		7.2		4.1		0.9		−2.0		−4.3		−9.0		−15.0		31
Kelly Field (San Antonio), Tex.[3] (206 m)	18.7		19.0		19.0		18.0		15.4		12.9		10.0		3.2		−4.2		26
Lakehurst, N. J.[4] (3 m)	8.8		10.0		7.9		5.5		3.0		0.8		−1.2		−5.1		−10.0		26
Maxwell Field (Montgomery), Ala.[3] (52 m)	19.8		20.6		17.5		14.1		11.6		8.9		5.7		−0.8		−7.0		30
Mitchel Field (Hempstead, L. I.), N. Y.[3] (29 m)	10.3		11.7		8.7		5.8		3.6		1.2		−0.9		−6.0		−12.3		29
Murfreesboro, Tenn.[1] (174 m)	14.8		16.2		15.3		12.3		10.1		7.5		4.5		−1.7		−8.0		31
Norfolk, Va.[4] (10 m)	15.2	−2.7	15.2	−1.9	13.2	−2.0	11.0	−1.5	8.4	−1.3	5.8	−1.1	3.6	−0.5	−1.6	−0.5	−7.3	−0.5	28
Oklahoma City, Okla.[1] (391 m)	15.5		15.3		14.9		13.7		11.8		8.8		5.2		−2.8		−10.9		29
Omaha, Nebr.[1] (300 m)	10.0	−2.9	10.6	−3.1	10.2	−3.5	8.1	−3.5	5.7	−3.6	3.3	−3.2	0.9	−2.6	−4.7	−1.4	−11.4	−1.1	31
Pearl Harbor, Territory of Hawaii[4] (6 m)																			
Pensacola, Fla.[4] (24 m)	23.2	+0.6	21.6	+0.8	18.8	+0.6	16.3	+0.3	13.8	+0.9	11.3	+1.0	9.1	+1.4	3.6	+1.6	−2.4	+2.1	30
San Diego, Calif.[4] (10 m)	15.2	−2.4	12.2	−1.8	11.5	−2.2	10.8	−1.7	11.0	−0.4	8.9	+0.1	6.0	0.0	−0.1	+0.1	−6.7	+0.1	30
Scott Field (Belleville), Ill.[3] (135 m)	12.0		14.8		13.0		10.2		7.6		5.6		3.1		−2.8		−9.1		22
Seattle, Wash.[4] (25 m)	8.1	−5.0	7.4	−2.8	6.4	−1.6	4.1	−1.3	1.3	−1.3	−1.3	−1.2	−3.7	−1.0	−9.3	−0.7	−15.3	−0.7	28
Selfridge Field (Mount Clemens), Mich.[3] (177 m)	6.9		9.6		7.2		5.0		3.0		1.2		−0.8		−6.5		−13.4		31
Spokane, Wash.[5] (596 m)	13.5				10.8		7.8		4.1		0.4		−3.4		−9.8		−17.0		31
Sunnyvale, Calif.[4] (10 m)	14.4	−1.5	10.8	−1.3	10.2	−0.4	11.0	+1.1	8.8	+1.1	6.0	+1.2	3.1	+1.3	−3.5	+1.7	−11.3	+1.7	25
Washington, D. C.[4] (13 m)	10.9	−5.7	10.9	−4.0	9.8	−3.2	7.4	−3.1	5.4	−2.7	3.4	−2.1	1.2	−1.7	−3.4	−1.0	−9.7	−1.0	27
Wright Field (Dayton), Ohio[3] (244 m)	9.5		11.6		11.0		8.7		6.3		3.7		1.0		−4.2		−10.6		29

[1] Weather Bureau. [2] Massachusetts Institute of Technology. [3] Army. [4] Navy. [5] National Guard.

TABLE 1.—*Mean free-air temperatures and relative humidities obtained by airplanes during May 1935*—Continued

RELATIVE HUMIDITY (PERCENT)

Stations	Altitude (meters) m. s. l.																Number of observations
	Surface		500		1,000		1,500		2,000		2,500		3,000		4,000		5,000		
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	
Billings, Mont.	82						61		50		64		68		63		61		
Boston, Mass.	62	−3	60	−1	60	+2	60	+2	61	+3	57	+2	52	−2	47	−1	46	−1	
Cheyenne, Wyo.	85								82		72		68		64		62		
Fargo, N. Dak.	79		64		58		60		61		58		51		42		40		
Kelly Field (San Antonio), Tex.	95		83		69		53		45		46		43		42		41		
Lakehurst, N. J.	85		61		58		60		61		59		54		46		43		
Maxwell Field (Montgomery), Ala.	84		68		70		66		52		43		41		36		29		
Mitchel Field (Hempstead, L. I.), N. Y.	76		59		58		60		60		57		53		49		45		
Murfreesboro, Tenn.	89		76		72		74		64		58		57		55		52		
Norfolk, Va.	76	+3	65	+1	62	+3	60	+3	61	+5	61	+6	54	+2	46	+2	43	+2	
Oklahoma City, Okla.	86		82		66		59		50		45		45		50		52		
Omaha, Nebr.	88	+10	82	+9	74	+9	70	+8	72	+13	69	+13	65	+12	56	+6	54	+6	
Pensacola, Fla.	85	+4	81	+5	76	+7	70	+7	60	+3	51	0	47	+1	38	+2	33	+2	
San Diego, Calif.	77	+7	82	+5	72	+8	62	+9	45	+5	37	+3	34	+4	30	+3	28	+3	
Scott Field (Belleville), Ill.	87		62		61		62		61		55		51		54		49		
Seattle, Wash.	84	+11	80	+6	76	+5	74	+5	74	+7	69	+7	64	+7	57	+2	54	+2	
Selfridge Field (Mount Clemens), Mich.	80		61		61		59		54		50		44		40		37		
Spokane, Wash.	51				52		52		52		55		58		54		41		
Sunnyvale, Calif.	70	+5	74	+3	66	+1	45	−6	38	−7	36	−7	36	−6	33	−4	33	−4	
Washington, D. C.	75	+7	64	+2	60	+2	61	+3	59	+2	56	+1	54	+2	48	+1	49	+1	
Wright Field (Dayton), Ohio	84		68		61		62		58		55		57		57		54		

Late reports for April 1935

TEMPERATURE (°C.)

Pearl Harbor, Territory of Hawaii[4]	19.9	−3.5	18.7	−1.4	15.7	−0.7	12.9	−0.8	11.2	−0.1	10.4	+0.3	8.9	+0.3	4.5	−0.5	−1.9	−0.5	30

RELATIVE HUMIDITY (PERCENT)

Pearl Harbor, Territory of Hawaii[4]	75	+10	74	+2	74	−2	72	−1	64	−4	60	−5	40	−2	27	+1	24	+1	

Observations taken about 5 a. m., 75th meridian time, except along the Pacific coast and Hawaii, where they are taken at dawn.

NOTE.—The departures are based on "normals" covering the following number of observations made during the same month in previous years, including the current year Boston, 73; Norfolk, 129; Omaha, 124; Pensacola, 166; San Diego, 144; Seattle, 67; Sunnyvale, 65; Washington, 193; Pearl Harbor (April), 82.

TABLE 2.—*Free-air resultant winds (meters per second) based on pilot-balloon observations made near 6 a. m. (E. S. T.) during May 1935*

[Wind from N=360°, E=90°, etc.]

Altitude (m) m. s. l.	Albuquerque, N.Mex. (1,554 m)		Atlanta, Ga. (309 m)		Billings, Mont. (1,088 m)		Boston, Mass. (15 m)		Cheyenne, Wyo. (1,873 m)		Chicago, Ill. (192 m)		Cincinnati, Ohio, (153 m)		Detroit, Mich. (204 m)		Fargo, N. Dak. (274 m)		Houston, Tex. (21 m)		Key West, Fla. (11 m)		Medford, Oreg. (410 m)		Murfreesboro, Tenn. (180 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	95	0.6	260	0.8	342	1.2	292	2.4	277	3.1	63	1.8	55	0.8	307	1.1	49	0.5	127	1.6	125	2.8	261	0.6	196	0.8
500			230	2.5			309	6.5			70	2.3	87	1.8	357	2.4	93	1.4	154	7.0	124	5.0	282	1.1	211	4.7
1,000			234	4.4			307	7.2			92	1.4	282	1.5	10	2.0	86	0.2	170	5.7	117	3.9	318	1.8	217	6.1
1,500			244	4.9	168	0.4	296	7.5			217	0.2	271	3.7	331	3.3	150	0.8	182	4.5	109	1.8	350	0.9	228	5.3
2,000	255	1.7	258	5.0	218	1.1	297	10.1	269	4.3	258	0.9	276	5.2	319	5.8	135	0.8	199	3.1	90	0.8	14	1.9	268	4.0
2,500	263	4.4	258	5.4	264	2.0	299	11.4	277	5.6	2	1.7	295	5.4	309	7.7	136	1.3	215	3.4	78	0.4	343	2.4	268	5.2
3,000	274	6.9	259	4.2	291	3.2	297	11.1	295	5.5	324	2.6	302	5.6	310	8.7	96	0.2	242	4.7	299	0.6	301	4.1	262	6.8
4,000	258	7.5	268	3.6	280	6.1	295	11.0	290	7.6	328	3.2	302	12.6	307	9.0	282	3.2	263	4.9	265	3.5	319	6.6		
5,000	242	12.0			268	7.7	293	11.2	317	4.6					298	8.5	285	5.6	292	8.6			320	10.6		

Altitude (m) m. s. l.	Newark, N. J. (14 m)		Oakland, Calif. (8 m)		Oklahoma City, Okla. (402 m)		Omaha, Nebr. (306 m)		Pearl Harbor, Territory of Hawaii[1] (68 m)		Pensacola, Fla.[1] (24 m)		St. Louis, Mo. (170 m)		Salt Lake City, Utah (1,294 m)		San Diego, Calif. (15 m)		Sault Ste. Marie, Mich. (198 m)		Seattle, Wash. (14 m)		Spokane, Wash. (603 m)		Washington, D. C. (10 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	315	1.5	237	0.5	153	1.2	44	1.4	20	2.7	157	1.9	145	0.8	157	1.7	171	0.7	331	0.9	140	1.4	110	0.5	348	0.6
500	324	4.8	314	2.4	190	3.9	72	1.5	60	6.4	151	3.0	170	2.4			226	1.2	31	3.9	112	0.1			300	2.9
1,000	327	4.9	350	5.4	212	8.5	162	2.4	48	3.3	190	2.4	224	4.3			301	2.7	19	4.2	305	0.9	235	0.7	295	4.0
1,500	302	5.1	358	5.2	230	6.8	167	1.7	82	3.8	216	3.6	243	4.9	167	1.5	333	5.4	345	5.2	321	2.1	274	1.2	301	5.8
2,000	273	7.6	357	5.2	250	7.7	230	1.9	33	0.9	246	3.8	270	3.7	212	0.6			336	6.7	322	2.5	285	1.8	294	7.6
2,500	276	10.6	354	6.8	246	10.3	266	2.6	25	0.9	276	5.4	260	4.6	270	1.3			339	7.0	302	2.2	297	3.0	297	10.1
3,000	291	14.1	341	8.0	260	9.0	263	4.5	226	1.8	284	6.9	262	7.7	296	2.0			337	9.1	292	3.0	292	3.6	298	12.1
4,000			339	11.0	276	10.6	257	7.6			281	8.1			288	6.3			339	7.3	302	5.9	287	5.2	301	11.5
5,000					247	8.0									306	4.8					308	7.5	314	7.1		

[1] Navy stations.

RIVERS AND FLOODS

[River and Flood Division, MONTROSE W. HAYES, in charge]

By RICHMOND T. ZOCH

The noteworthy floods in the United States during the month of May are described below.

A moderate flood occurred in the Tombigbee River System in Alabama. However, due to inundations in April, little progress had been made in planting lowlands, and the May stages were not high enough to cause damage to higher ground; therefore, the damage was small, and was confined to the region south of Demopolis.

The official in charge of the Weather Bureau office at Denver comments as follows on the floods in Colorado, particularly in the South Platte Basin:

On the 26th a large volume of water which surged down Pawnee Creek, overturned an automobile a short distance south of Haxtun, Colo., drowning a mother and two children.

On the 27th, when part of the dam of Terry Lake, north and west of Longmont, went out, one life was lost and low-lying farm lands and a part of the city of Longmont were flooded, but the property damage was reported to have been slight.

During and after the occurrence of the excessive local rains along the northern slope of the Arkansas-Platte Divide, Kiowa, Bijou Badger, Beaver, and Comanche Creeks quickly overflowed their banks and sent enormous volumes of water toward the South Platte at Fort Morgan and Brush, Colo. At the same time, Cherry Creek, where it flows through Denver, reached a bankful stage, and ordinary streamlets and arroyos in this part of the State soon became raging torrents. As the month closed, the combined floods in the small streams north of the Arkansas-South Platte Divide were leaving the northeast corner of the State at Sterling and Julesburg.

The total loss of life in Colorado, as a result of the floods caused by the excessive rains of the 30th, is given as 19. Four of these deaths occurred in Colorado Springs and its immediate vicinity, and the remainder along the streams already referred to north of the Arkansas-South Platte Divide.

The best estimates of property loss and damage which it has been possible to obtain place the damage at $6,000,000.

There was a serious flood in the Kansas River. Little loss resulted from overflows of the Kansas River itself, but serious damage resulted along two of its tributaries. On May 27 Mill Creek, in the vicinity of Paxico, reached a stage which is believed to be the highest since the coming of the white man. The total damage there approximated $150,000. The Delaware River reached a very high stage, and the loss in its valley was close to $100,000. There was also considerable damage along creeks emptying into the Kansas River.

There were moderate floods in some of the streams of the Wabash River system in Indiana. They were severest along the lower reaches of the West Fork of the White River, the main stream of the White River, and the Wabash below the mouth of the White. Most of the damage was to prospective crops. There were no other floods of importance in the Ohio Basin.

There were serious floods in the Arkansas Basin. On the 30th excessive local rains around Colorado Springs caused severe floods in the Monument and Fountain Creeks. Four lives were lost in Colorado Springs (as noted above) and the property damage was placed at $1,800,000. The highest stage ever recorded was reached at Fountain, Colo.

The official in charge of the Weather Bureau office, Fort Smith, Ark., reports as follows on the flood in the Verdigris River:

The Verdigris reached a stage of 43.7 at Independence, Kans., at 11 a. m., May 30, which was 1.5 feet below the record high of 45.2 on April 20, 1927. All the lowlands of the Verdigris from Toronto in the north to the Oklahoma line were flooded. Thousands of acres of wheat which gave promise of an excellent crop, and a large acreage of corn were destroyed.

The Neosho and North Canadian Rivers attained high stages in their upper reaches. The other floods in the Arkansas Basin were of less importance.

The floods in the Red River Basin caused five breaks in the levees near Fulton, Ark., and property damage to the extent of $600,000. Warnings of all the rises were timely. In connection with these floods the following comments of the official in charge of the Weather Bureau office at Shreveport, La., are of interest:

These floods of April and May were of considerable proportions and caused heavy property losses along the Red River and its tributaries at and above Shreveport, in Louisiana, Texas, Arkansas, and Oklahoma. Eight persons were reported to have been drowned in the vicinity of Altus, Okla.

The heavy rainfalls that caused the floods were reported intermittently between April 19 and May 20, and were more or less irregularly distributed. Rains in 48-hour periods ending on May 5 and May 19, respectively, were the heaviest and most general.

Beginning in March and ending in May, a flood crest passed down the lower Mississippi River. It caused considerable damage, but less than the last previous one, which was in 1933. The flood in the Yazoo River Basin caused the loss of 13 lives and a great amount of property. At the close of May the river was again rising and had passed above the flood stage at many points. With the passage of the first crest the Tallahatchie and Yazoo Rivers fell below the flood stage.

Except in the Rio Grande, where there was only a slight flood, there were moderate to severe floods in all the rivers of Texas which empty into the Gulf of Mexico. Ten persons were drowned.

Comments on floods in the lower Missouri River Basin will be made in a later issue of the MONTHLY WEATHER REVIEW.

Table of flood stages during May 1935

[All dates are in May unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ST. LAWRENCE DRAINAGE					
St. Marys: Decatur, Ind	*Feet* 13	3	9	*Feet* 16.1	7
ATLANTIC SLOPE DRAINAGE					
Chenango: Sherburne, N. Y	8	8	8	8.2	8
Susquehanna: Oneonta, N. Y	12	8	8	13.0	8
Cape Fear: Lock No. 2, Elizabethtown, N. C	20	23	23	21.1	23
Santee: Rimini, S. C	12	24	24	12.94	24
EAST GULF OF MEXICO DRAINAGE					
Black Warrior: Lock No. 10, Tuscaloosa, Ala	46	8	8	47.1	8
Tombigbee:					
Lock No. 4, Demopolis, Ala	39	8	15	46.8	12
Lock No. 3, Ala	33	7	17	48.7	12, 13
Lock No. 2, Ala	46	10	15	49.7	13
Lock No. 1, Ala	31	10	18	35.0	15, 16
Pearl:					
Edinburg, Miss	20	9	11	20.5	11
Jackson, Miss	18	6	29	27.0	13, 14
Monticello, Miss	15	7	11	16.7	8
		21	24	18.3	22
Columbia, Miss	17	23	25	17.7	24
Pearl River, La	12	Mar. 9	4	14.7	Apr. 23
		11	June 3	14.6	24

Table of flood stages during May 1935—Continued

River and station	Flood stage	Above flood stages—dates From—	To—	Crest Stage	Date
MISSISSIPPI SYSTEM					
Upper Mississippi Basin					
Illinois:	*Feet*			*Feet*	
Morris, Ill.	13	10	11	14.8	10
		13	15	14.6	14
Peru, Ill.	17	8	20	20.0	14
Peoria, Ill.	18	9	26	21.5	16
Havana, Ill.	14	4	(1)	20.0	17
Beardstown, Ill.	14	3	(1)	22.4	17
Meramec: Valley Park, Mo.	14	22	22	15.3	22
Mississippi:					
Grafton, Ill.	18	17	17	18.2	17
Alton, Ill.	21	31	(1)	(1)	(1)
Missouri Basin					
Solomon: Beloit, Kans.	18	20	22	22.56	21
		29	31	25.50	30
Smoky Hill: Lindsborg, Kans.	21	23	23	22.22	23
		29	29	21.15	29
Republican: Concordia, Kans.	8	29	31	9.55	28
Big Blue: Blue Rapids, Kans.	20	21	22	24.88	22
Kansas:					
Manhattan, Kans.	17	28	28	18.2	28
Lawrence, Kans.	18	28	29	19.4	28, 29
Grand:					
Gallatin, Mo.	20	21	21	22.1	21
		28	(1)	25.14	29
		2	3	19.2	2
Chillicothe, Mo.	18	17	17	19.9	17
		20	26	26.7	22
		28	(1)	28.37	29
Brunswick, Mo.	12	21	(1)	(1)	(1)
Osage:					
Quenemo, Kans.	30	29	30	36.65	29
Ottawa, Kans.	24	29	31	25.8	30
La Cygne, Kans.	23	21	23	24.1	23
		30	(1)	(1)	(1)
Osceola, Mo.	20	29	(1)	(1)	(1)
Tuscumbia, Mo.	25	28	(1)	(1)	(1)
St. Thomas, Mo.	20	29	(1)	(1)	(1)
Missouri:					
Waverly, Mo.	18	29	(1)	19.85	30
Boonville, Mo.	21	30	(1)	(1)	(1)
Hermann, Mo.	21	30	(1)	(1)	(1)
St. Charles, Mo.	25	30	(1)	(1)	(1)
Ohio Basin					
Walhonding: Walhonding, Ohio	8	7	7	8.0	7
Hocking: Athens, Ohio	17	4	4	17.45	4
Gauley: Summersville, W. Va.	10	7	8	13.06	7
Scioto:					
La Rue, Ohio	11	4	4	11.3	4
Circleville, Ohio	14	4	4	14.4	4
Kentucky River, North Fork: Jackson, Ky.	28	17	17	29.5	17
White River, West Fork:					
Anderson, Ind.	8	3	10	11.0	4
Elliston, Ind.	18	3	18	25.0	6
Edwardsport, Ind.	12	4	23	18.7	8
White:					
Petersburg, Ind.	16	6	23	20.8	10, 11
Hazleton, Ind.	16	7	25	21.6	11
Wabash:					
Bluffton, Ind.	10	5	6	10.0	5, 6
LaFayette, Ind.	11	4	11	17.0	5
Covington, Ind.	16	4	13	20.7	6
Terre Haute, Ind.	14	4	18	18.1	9
Vincennes, Ind.	14	7	22	17.3	15
Mount Carmel, Ill.	19	9	24	21.5	12–14
New Harmony, Ind.	15	10	25	17.2	15, 16
Ohio:					
Dam No. 47, Newburgh, Ind.	38	18	24	39.1	21
Evansville, Ind.	35	17	26	36.9	22
Dam No. 48, near Henderson, Ky.	38	21	24	38.3	22
Dam No. 49, near Uniontown, Ky.	37	17	27	39.0	23
Dam No. 50, Fords Ferry, Ky.	34	10	30	41.0	23, 24
Dam No. 52, Brookport, Ill.	37	20	29	39.3	25, 26
Dam No. 53, near Mound City, Ill.	42	17	(1)	46.3	26, 27
Cairo, Ill.	40	13	(1)	45.9	26, 27
White Basin					
Black: Black Rock, Ark.	14	5	28	22.9	6
White:					
Calico Rock, Ark.	18	6	6	18.5	6
Batesville, Ark.	23	6	6	27.5	6
Newport, Ark.	26	7	10	26.6	8
Georgetown, Ark.	21	7	(1)	24.1	11, 12
Clarendon,[2] Ark.	26	11	(1)	29.0	16–19

[1] Flood continued into June.
[2] More than 1 crest occurred during the period the river remained above flood stage that given is the highest crest.

Table of flood stages during May 1935—Continued

River and station	Flood stage	Above flood stages—dates From—	To—	Crest Stage	Date
MISSISSIPPI SYSTEM—continued					
Arkansas Basin					
	Feet			*Feet*	
Fountain: Fountain, Colo.	8	30	30	20.0	30
Little Arkansas: Sedgwick, Kans.	18	27	27	22.1	27
Cimarron: Perkins, Okla.	11	19	20	13.8	19
Cottonwood: Emporia, Kans.	20	21	22	20.4	21
		30	31	21.4	30
Neosho:					
Neosho Rapids, Kans.	22	30	30	23.7	30
Le Roy, Kans.	18	28	31	25.47	29
Iola, Kans.	15	28	31	18.2	29
Oswego, Kans.	17	20	24	22.82	22
		29	31	24.94	30
Fort Gibson, Okla.	22	23	24	23.0	24
North Canadian:					
Woodward, Okla.	6	14	14	8.4	14
		18	18	10.4	18
Canton, Okla.	6	14	15	7.0	15
		18	20	10.2	19
Yukon, Okla.	8	17	17	8.7	17
		19	25	11.1	23
		29	31	8.8	30
Oklahoma City, Okla.	12	22	23	14.6	23
Canadian: Union, Okla.	6	18	18	7.0	18
Poteau, Poteau, Okla.	21	6	9	35.3	6
		17	22	27.4	18
Petit Jean: Danville, Ark.	20	4	9	29.5	5
		17	21	21.75	17
Arkansas:					
Fort Lyon, Colo.	6	19	19	6.4	19
Great Bend, Kans.	5	20	30	7.0	30
Wichita, Kans.	9	29	29	9.3	29
Arkansas City, Kans.	15	16	16	16.0	16
		20	22	17.0	22
		30	31	18.6	31
Webbers Falls, Okla.	23	22	23	23.7	23
Fort Smith, Ark.	22	6	7	22.6	6
		19	25	25.8	20
Van Buren, Ark.	22	6	7	22.5	7
		20	25	25.4	20–23
Dardanelle, Ark.	22	21	21	22.5	21
Morriliton, Ark.	20	6	9	21.8	7
		21	26	22.3	21
Red Basin					
Ouachita: Arkadelphia, Ark.	17	4	8	26.97	6
Camden, Ark.	26	5	16	39.04	9
Black: Jonesville, La.	50	9	(1)	51.9	22–29
Little: Whitecliffs, Ark.	25	4	14	29.6	8
		19	27	26.7	22
Sulphur:					
Ringo Crossing, Tex.	20	5	10	29.7	6
		16	23	25.0	20
		30	June 6	28.3	30
Naples, Tex.	22	Apr. 25	16	30.0	8, 9
		21	29	27.7	23
Cypress: Jefferson, Tex.	18	9	13	22.2	10
Red:					
Arthur City, Tex.	27	20	23	31.0	23
Index, Ark.	25	7	12	27.9	10
		18	28	31.1	25
Fulton, Ark.	25	6	June 8	34.1	26
Grand Ecore, La.	33	11	(1)	38.0	31
Alexandria, La.	32	8	(1)	(1)	(1)
Lower Mississippi Basin					
Big Lake Outlet: Manila, Ark.	10	8	29	13.0	13, 14
St. Francis:					
Fisk, Mo.	20	5	11	23.5	8
		21	26	23.6	23
St. Francis, Ark.	18	8	18	21.6	10
		26	(1)	20.8	27
Tallahatchie: Swan Lake, Miss.[2]	26	June 10	12	31.6	Mar. 16–17
Yazoo: Yazoo City, Miss.	29	Mar. 5	(1)	36.3	Apr. 11
Mississippi:					
New Madrid, Mo.	34	19	(1)	36.7	27, 28
Helena, Ark.	39	Mar. 18	1	49.2	Apr. 2
		18	(1)	(1)	(1)
Arkansas City, Ark.	42	Mar. 22	4	51.8	Apr. 6
		22	(1)	(1)	((1))
Greenville, Miss.	36	Mar. 23	5	45.5	Apr. 6, 7
		21	(1)	(1)	(1)
Vicksburg, Miss.	43	Apr. 1	5	46.7	Apr. 18
Natchez, Miss.	46	Apr. 2	10	50.3	Apr. 17–24
Angola, La.	45	Apr. 6	11	48.0	Apr. 20–27
		31	(1)	(1)	(1)

Table of flood stages during May 1935—Continued

River and station	Flood stage	Above flood stages—dates From—	To—	Crest Stage	Date
MISSISSIPPI SYSTEM—continued					
Lower Mississippi Basin—Continued					
Mississippi—Continued.	*Feet*			*Feet*	
Baton Rouge, La.	35	Apr. 6	12	38.4	7
		30	(1)	(1)	(1)
Donaldsonville, La.	28	Apr. 7	11	30.0	Apr. 25–27, May 7
Reserve, La.	22	Apr. 9	10	23.2	7
New Orleans, La.	17	6	7	17.31	6
Atchafalaya Basin					
Atchafalaya:					
Simmesport, La.	41	4	10	41.7	7,8
Melville, La.	37	Apr. 6	17	39.3	7,8
		20	(1)	(1)	(1)
Atchafalaya, La.	22	Mar. 15	(1)	24.5	5–10
WEST GULF OF MEXICO DRAINAGE					
Sabine:					
Logansport, La.	25	6	31	34.4	8
Bon Wier, Tex.	21	20	29	23.4	22
Orange, Tex.	4	25	30	4.7	26,27
Neches:					
Rockland, Tex.	22	7	14	28.5	9
		20	28	28.9	22
Beaumont, Tex.	7	25	31	7.7	29,30
West Fork: Fort Worth, Tex.	17	18	19	17.9	18
Elm Fork: Carrollton, Tex.	6	5	7	10.9	6
		15	23	13.0	19
Trinity:					
Dallas, Tex.	28	5	8	34.9	6
		16	24	42.1	20
Trinidad, Tex.	28	7	June 2	42.6	25

Table of flood stages during May 1935—Continued

River and station	Flood stage	Above flood stage—dates From—	To—	Crest Stage	Date
WEST GULF OF MEXICO DRAINAGE—contd.					
Trinity—Continued.	*Feet*			*Feet*	
Long Lake, Tex.	40	11	31	44.2	24
Riverside, Tex.	40	20	22	41.8	21
Liberty, Tex.	25	6	31	26.9	24,25
Brazos:					
Rainbow, Tex.	20	18	19	28.1	18
Waco, Tex.	27	18	20	34.9	19
Valley Junction, Tex.	44	20	22	48.5	21
Washington, Tex.	45	22	25	47.2	24
Hempstead, Tex.	42	24	26	43.2	25
Richmond, Tex.	35	24	28	36.5	27
Colorado:					
Marble Falls, Tex.	21	18	19	20.8	18
Austin, Tex.	21	18	19	28.0	19
Smithville, Tex.	25	20	21	26.7	20
Columbus, Tex.	29	19	25	33.3	23
Wharton, Tex.	26	20	27	36.7	25
Guadalupe:					
Gonzales, Tex.	20	19	22	27.3	20
Victoria, Tex.	21	5	10	27.9	8
		21	25	28.7	24
Nueces: Cotulla, Tex.	15	24	27	18.6	24
Rio Grande:					
Del Rio, Tex.	15	30	30	15.1	30
Eagle Pass, Tex.	16	18	18	16.8	18
Brownsville, Tex.	18	26	26	18.2	26
PACIFIC SLOPE DRAINAGE					
Columbia Basin					
Clearwater: Kamiah, Idaho.	12	23	25	12.6	23
Columbia: Vancouver, Wash.	15	29	(1)	(1)	(1)

[1] Flood continued into June.

WEATHER OF THE ATLANTIC AND PACIFIC OCEANS

[The Marine Division, W. F. McDONALD in Charge]

NORTH ATLANTIC OCEAN, MAY 1935

By H. C. HUNTER

Atmospheric pressure.—Over waters adjacent to Europe and Iceland the pressure averaged greater than normal. The northeasternmost portion showed a large excess; Lerwick, in the Shetland Islands, had a mean pressure 0.42 inch above normal. Over the central and most western portions of the North Atlantic pressure averaged a little less than normal, but over the Gulf of Mexico and nearby areas a very little greater than normal.

At coast and island stations, the highest pressures were mostly recorded during the period 5th to 12th, and the lowest during 12th to 22d.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Atlantic Ocean and its shores, May 1935*

Station	Average pressure	Departure	Highest	Date	Lowest	Date
	Inches	*Inch*	*Inches*		*Inches*	
Julianehaab, Greenland	29.78	.....	30.24	9	29.18	5
Reykjavik, Iceland	30.19	+0.27	30.58	12	29.78	1
Lerwick, Shetland Islands	30.22	+.42	30.53	8	29.73	17
Valencia, Ireland	30.14	+.19	30.50	7	29.73	3
Lisbon, Portugal	29.99	+.02	30.23	6	29.72	22,23
Madeira	30.05	+.04	30.17	30	29.88	13
Horta, Azores	30.13	−.03	30.34	3	29.74	12
Belle Isle, Newfoundland	29.76	−.18	30.24	10	29.32	20
Halifax, Nova Scotia	29.87	−.10	30.26	5,9	29.54	1,15
Nantucket	29.96	−.03	30.37	5	29.55	21
Hatteras	30.01	.00	30.26	9	29.54	21
Bermuda	30.05	−.06	30.28	10	29.78	18
Turks Island	29.99	−.01	30.12	7,8	29.82	16
Key West	29.98	+.01	30.12	8	29.82	18
New Orleans	30.00	+.03	30.16	26	29.74	20

NOTE.—All data based on a. m. observations only, with departures compiled from best available normals related to time of observation, except Hatteras, Key West, Nantucket, and New Orleans, which are 24-hour corrected means.

The highest pressure thus far reported by a vessel was 30.58 inches by the Swedish steamship *Braheholm*, during the forenoon of the 9th, when near latitude 58° N., longitude 10° W. The lowest reading was 28.66 inches, by the American steamship *Scanstates*, during the forenoon of the 10th, near 46° N., 42° W.

Cyclones and gales.—There was considerable storminess for the time of the year, but no wind of force 12 has been reported. Two vessels encountered force 11; the earlier instance was the Dutch motorship *Tabian*, on the evening of the 5th, when northwest of Horta. The ship was then near the southern end of a long trough of low pressure. Very few other vessels noted gales in connection with this trough.

The principal period of storminess was from the 7th to 11th, when gales were met by numerous steamships, chiefly between 55° and 35° west longitude, along or near the chief lanes to northern Europe. During this time low pressure prevailed in the Grand Banks area, and for a moderate distance to eastward; at the same time pressure was mainly higher than normal in the far north, as well as on the continental coasts and over the tropical ocean; strong gradients resulted as the LOW moved slowly northeastward.

During this period of storminess, whole gales (force 10) were noted by numerous vessels; and the second instance of force 11 was noted by the German liner *Stuttgart* during the night of the 7–8th. By the 11th the high pressure to northward was decreasing, and the LOW moved in that direction and lost strength.

A brief gale was encountered south of Jamaica on the 13th; and on the 17th a whole gale was met a considerable distance south of Bermuda. The LOW with which this latter gale was connected was noted near Haiti on the

16th, and seemingly traveled to northeastward to unite with a LOW from the South Atlantic States.

On the 18th and 19th several ships noted gales in the area south and southeast of Nova Scotia and thence eastward to about the 47th meridian. The LOW soon moved northward and ceased to affect the steamship routes.

A few days later another LOW advanced from near Hatteras to the vicinity of Sable Island, reaching the latter on the 22d. Again gales were experienced in the western part of the steamship lanes, but none of great force has been reported.

A few gales were met during the final week of May, in localities much scattered.

Fog.—There was almost complete absence of fog during May in the regions to northward and northeastward of the Azores, although east of the 15th meridian a little fog was noted in several areas.

Fog was reported along the African coast near Cape Blanco on the 2d, 3d, and 4th.

Two adjacent 5°-squares in the Grand Banks region (40° to 50° north latitude, 45° to 50° west longitude) had fog on 12 days during May, the chief periods being 8th to 12th and 21st to 31st.

In two other squares, one southeast of Nova Scotia and the other east of Delaware and Chesapeake Bays, fog was noted on 10 days.

OCEAN GALES AND STORMS, MAY 1935

Vessel	Voyage		Position at time of lowest barometer		Gale began May—	Time of lowest barometer May—	Gale ended May—	Lowest barometer	Direction of wind when gale began	Direction and force of wind at time of lowest barometer	Direction of wind when gale ended	Direction and highest force of wind	Shifts of wind near time of lowest barometer
	From—	To—	Latitude	Longitude									
NORTH ATLANTIC OCEAN			° ′	° ′				*Inches*					
Tabian, Du. M. S.	Gibraltar	Boston	[1]40 50 N.	35 01 W.	5	6p, 5	5	[2]29.59	S	W, 10	NNW.	WNW, 11.	S-W-NNW.
Independence Hall, Am. S. S.	Bordeaux	New York	45 28 N.	37 10 W.	6	9a, 6	6	29.38	SE	SW, 8	WNW.	WNW, 9.	SE-SW-WNW.
Mendota, U. S. C. G.	On ice patrol out from Halifax.		42 01 N.	50 32 W.	7	1p, 7	7	29.44	WNW.	NW, 9	NW.	NW, 9	W-NW.
Beemsterdyk, Du. S. S.	Rotterdam	New York	42 30 N.	43 44 W.	7	1a, 8	8	29.36	SSE.	WNW, 3.	NW.	SSW, 9	SSE-SSW-WNW.
Black Tern, Am. S. S.	Antwerp	do	41 45 N.	43 20 W.	7	2a, 8	8	29.42	S	W, 8	WNW.	NW, 9	S-W-NW.
Eskdene, Br. S. S.	St. Vincent, C. V. I.	Montreal	38 08 N.	50 00 W.	7	Mdt., 8	10	29.62	SW	W, 8	N.	W, 10	None.
Tabian, Du. M. S.	Gibraltar	Boston	40 57 N.	52 34 W.	8	Mdt., 8	9	[2]29.41	WNW.	WNW, 8.	NNW.	NNW, 10.	W-WNW-NNW.
Independence Hall, Am. S. S.	Bordeaux	New York	43 52 N.	52 28 W.	9	2a, 9	9	29.54	NE	NNE, 10.	NNW.	NNE, 10.	NE-NNE-N.
Stuttgart, Ger. S. S.	New York	Galway	44 49 N.	39 06 W.	7	4a, 9	8	29.50	WSW.	SE, 6	NW.	WNW, 11.	E-SE.
Beemsterdyk, Du. S. S.	Rotterdam	New York	40 58 N.	50 01 W.	9	4a, 9	10	29.16	W	SW, 6	NNW.	NW, 10.	SW-NW.
Steel Exporter, Am. S. S.	Avonmouth	Baltimore	41 35 N.	45 10 W.	7	Noon, 9.	11	29.03	SE.	W, 9	NW.	W, 10	SSW-W.
Black Condor, Am. S. S.	Rotterdam	New York	44 04 N.	44 00 W.	10	9p, 9	11	28.91	NNW.	NNW, 4.	NW.	NW, 10.	S-NNW-N.
Cingalese Prince, Br. M. S.	Gibraltar	Halifax	39 31 N.	40 50 W.	9	10p, 9	11	29.43	SSW.	SSW, 8	NNW.	NW, 10.	Steady.
Scanstates, Am. S. S.	Copenhagen	New York	45 36 N.	42 30 W.	10	9a, 10	11	28.66	WNW.	SE, 5	WNW.	NW, 9	SE-WNW.
Foylebank, Br. M. S.	Gibraltar	Halifax	37 51 N.	39 54 W.	11	9a, 11	11	29.68	WNW.	WNW, 8.	WNW.	WNW, 9.	
Colombia, Am. S. S.	Colon	Kingston	15 16 N.	77 50 W.	13	5p, 13	13	29.85	N	N, 8	NE.	N, 8	N-NE.
Darien, Pan. S. S.	Philadelphia	Puerto Barrios.	37 30 N.	74 54 W.	14	7a, 14	15	29.82	W	Calm	N.	NW, 9	
Georgia, Dan. S. S.	Bremen	Baltimore	42 39 N.	53 40 W.	15	7a, 15	15	29.59	SW	SW, 9	W.	WSW, 9.	SW-W.
Jean Jadot, Belg. S. S.	Antwerp	New York	49 49 N.	6 30 W.	17	Noon, 17	17	29.75	N	N, 9	NNE.	N, 9	None.
Magdala, Du. M. S.	Rotterdam	Curacao	26 17 N.	62 38 W.	17	8p, 17	18	29.62	SSE.	S, 9	W.	S, 10	SSE-SW.
Mahronda, Br. S. S.	Boston	London	41 17 N.	61 35 W.	17	2a, 18	18	29.14	NNE.	N, 8	NW.	NNE, 9	NNE-N-NW.
Emanuel Nobel, Belg. S. S.	Houston	Ghent	[1]37 13 N.	66 39 W.	21	4p, 21	21	29.39	S	S, 8	SSW.	SSW, 9	S-SSW.
Boschdyk, Du. S. S.	Rotterdam	New York	40 40 N.	64 43 W.	21	7p, 21	21	[2]29.26	NE	NE, 7	NNE.	NNE, 9	ENE-NNE.
Collamer, Am. S. S.	Havre	do	40 58 N.	59 20 W.	21	2a, 22	22	29.19	S	SSW, 9	NW.	SSW, 9	SSW-NW.
Jean Jadot, Belg. S. S.	Antwerp	do	42 45 N.	45 10 W.	22	8p, 22	22	29.81	SE.	SW, 9	NW.	SW, 9	SE-SW-NW.
Exmouth, Am. S. S.	Casablanca	do	35 12 N.	62 16 W.	25	10a, 25	25	29.67	S	SW, 8	SW.	SW, 8	S-SW-WSW.
Emanuel Nobel, Belg. S. S.	Houston	Ghent	[1]40 56 N.	44 21 W.	26	4a, 26	26	29.56	SW	NNW, 7.	WNW.	SW, 9	SW-NNW-N.
Steel Trader, Am. S. S.	Swansea	Montreal	50 18 N.	38 42 W.	26	7p, 27	29	29.35	SW	SW, 9	W.	W, 10	SW-SSW-WSW.
American Importer, Am. S. S.	Belfast	New York	[1]49 49 N.	29 46 W.	28	10a, 28	30	29.72	SW	S, 6	WSW.	WSW, 9	SW-S-W.
NORTH PACIFIC OCEAN													
Koyo Maru, Jap. S. S.	Port San Luis	Yokohama	34 01 N.	147 45 E.	[3]30	Noon, 1	[3]30	29.60	ESE.	SSW, 7	SW.	SSE, 8	SSW-SW.
Golden Dragon, Am. S. S.	San Francisco	Osaka	42 32 N.	155 21 E.	1	1a, 3	4	29.21	SE.	SW, 7	NW.	S, 10	SW-W.
Peter Kerr, Am. S. S.	Manila	San Francisco	45 00 N.	171 30 E.	3	8a, 3	3	29.52	SE.	SE, 8	S.	SE, 8	SE-S.
Kyokuto Maru, Jap. M. S.	Los Angeles	Nagasaki	42 54 N.	155 39 E.	3	1p, 3	3	29.18	W	SW, 6	WNW.	W, 8	SW-W.
Tyndareus, Br. S. S.	Victoria	Yokohama	[1]43 36 N.	155 41 E.	3	3p, 3	4	29.18	W	WSW, 6	W.	W, 9	WSW-W.
Golden Horn, Am. S. S.	San Francisco	do	46 30 N.	172 48 E.	5	Mdt., 4	5	29.60	W	SW, 4	W.	W, 8	SW-WSW.
Do	do	do	44 43 N.	164 07 E.	7	9a, 7	7	29.62	NNW.	NNW, 6	NNW.	NNW, 8	NE-NNW.
Somerville, Nor. M. S.	Los Angeles	Shanghai	[3]30 18 N.	148 57 E.	8	8a, 8	8	29.48	ENE.	E, 7	ENE.	ENE, 8	E-ENE.
Pres. Jackson, Am. S. S.	Yokohama	Seattle	[1]48 34 N.	175 41 E.	8	2a, 9	8	28.88	NW.	N, 7	NW.	NW, 8	NW-N.
Do	do	do	50 06 N.	157 34 W.	10	6p, 10	11	29.52	WNW.	NW, 7	WSW.	WSW, 8	NNW-NW-W.
Tantalus, Br. M. S.	do	Victoria	47 41 N.	172 04 E.	13	Mdt., 14	14	29.54	NE.	NNE, 5	NE.	ENE, 9	None.
City of Vancouver, Br. S. S.	Vancouver	Muroran	[1]46 00 N.	152 28 E.	16	4a, 17	16	29.57	SE.	S, 6	SE.	SE, 8	SE-S.
Texas, Am. S. S.	Dairen	San Francisco	45 39 N.	167 19 W.	21	Noon, 21	21	[2]29.63	SE.	SSE, 8	SSE.	SE, 8	SE-S.
Golden Star, Am. S. S.	Manila	do	41 36 N.	177 00 W.	21	3p, 21	21	29.40	S	S, 9	SW.	S, 9	S-WSW.
Vega, U. S. N. Aux.	Dutch Harbor	Bremerton	52 48 N.	155 18 W.	22	2a, 24	22	29.19	ENE.	S, 4	ENE.	ENE, 9	ESE-S.
Talthybius, Br. S. S.	Yokohama	Victoria	49 47 N.	164 53 W.	29	4a, 29	29	28.99	WSW.	SSW, 2	SW.	WSW, 8	S-WSW.
Golden Star, Am. S. S.	Manila	San Francisco	38 05 N.	123 30 W.	30	4a, 31	31	30.00	NNW.	NNW, 8	NNW.	NNW, 9	None.

[1] Position approximate. [2] Barometer uncorrected. [3] April.

NORTH PACIFIC OCEAN, MAY 1935

By W. F. McDONALD

Atmospheric pressure.—Average pressure distribution over the North Pacific during May 1935 was nearly normal. Moderate low pressure was centered over the Aleutians (Dutch Harbor, 29.76 inches) and extended thence southwestward into the Philippine LOW (Manila, 29.78 inches). The Pacific HIGH was very persistent between the Hawaiian Islands and the American coast, and often extended northward over the Alaskan Peninsula, and at times joined with high-pressure areas over western Canada.

The lowest barometer reading reported by any ship was 28.88 inches, observed on the American steamship *President Jackson*, May 8th, near 49° N., 176° E.; but another fairly low reading was observed on the 29th, on the British steamship *Talthybius*, near 50° N., 165° W., where the pressure was 28.99 inches.

Highest pressures at sea were slightly above 30.60 inches, observed in the Gulf of Alaska, on the 7th and 8th.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure at sea level, North Pacific Ocean, May 1935, at selected stations*

Stations	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Inches	*Inch*	*Inches*		*Inches*	
Point Barrow	30.16	+0.07	30.86	9	29.78	31
Dutch Harbor	29.76	−.08	30.34	7	29.18	24
St. Paul	29.88	+.04	30.38	8	29.42	16
Kodiak	29.84	.00	30.46	8	29.50	12
Juneau	30.04	+.05	30.37	6	29.53	15
Tatoosh Island	30.13	+.12	30.46	3	29.56	16
San Francisco	29.96	−.03	30.12	3	29.79	27
Mazatlan	29.88	+.03	30.00	8	29.80	12, 18
Honolulu	30.06	+.01	30.14	12	29.92	19
Midway Island	30.09	+.04	30.22	3	29.84	9
Guam	29.84	−.04	29.92	5	29.76	18
Manila	29.78	+.01	29.86	29	29.70	17
Naha	29.81	−.01	30.02	1	29.68	18, 19
Chichishima	29.91	.00	30.04	3	29.76	20, 24
Nemuro	29.84	----------	30.40	12	29.06	1

NOTE.—Data based on 1 daily observation only, except those for Juneau, Tatoosh Island, San Francisco, and Honolulu, which are based on 2 observations. Departures are computed from best available normals related to time of observation.

Cyclones and gales.—A cyclonic disturbance of considerable intensity, that originated south of Japan in the closing days of April, moved from the Kuril Islands to the western Aleutians and Bering Sea, attended by gales of force 8 to 10 along the western part of the main trans-Pacific steamship routes, May 1 to 8. The American steamer *Golden Dragon* on the 2d–3d encountered a whole gale (force 10) in connection with this disturbance, near 43° N., 155° E.; this is the highest wind so far reported from the North Pacific during May.

Slow-moving and usually moderate cyclonic conditions continued to dominate the Aleutian region and the Asiatic coast during most of the remainder of the month. The low pressure areas infrequently displayed storm intensity, and in only two cases (in which cyclonic areas deepened over the Aleutians and Gulf of Alaska during the last decade of the month) were scattered gale conditions encountered on the northern ship lanes.

The month as a whole was characterized by unusually quiet weather over the main areas of the North Pacific Ocean. No gales have been reported from latitudes below the 30th parallel; very few between 30° and 40° N., and only a moderate number from higher latitudes.

Fog.—Reports at hand show fog on 3 to 6 days in most of the 5°-squares along the northern ship lanes, with greatest prevalence between the 1st and 12th, and from the 19th to 25th.

Only a few days, all prior to the 12th, had fog along the American coast; during this first part of the month fog also occurred in a few uncommon positions below the 30th parallel—on the 9th along the China coast near Formosa, and on the 12th near Midway Island.

An interesting account of encounter with patches of dense low fog on the 9th, near 52° N., 170° W., is given by Second Officer J. A. Macdonnel, of the Canadian steamer *City of Vancouver*, who reports as follows, regarding conditions during more than 24 hours of run: "Ship encountered successive banks of vapor ranging from moderate to thick fog in density. The average patch took about one-half hour to traverse and the patches were interlaced with perfectly clear narrow lanes, often straight and revealing the horizon at either end. Several patches of 3 hours duration were experienced. Average depth of fog about 80 feet; blue sky overhead generally."

SEA-SURFACE TEMPERATURE SUMMARY FOR THE NORTH CENTRAL GULF OF MEXICO, 1912–33

By GILES SLOCUM

The monthly mean sea-surface temperatures in a representative area within the northeastern quadrant of the Gulf of Mexico are given in the accompanying table.

The period covered is from January 1912 to December 1933, inclusive. The observations of sea-surface temperature for the years 1917, 1918, and 1919 are few in number and the average temperatures for this period are therefore given only to whole degrees; the mean temperatures for the balance of the 22-year period are given to tenths of a degree.

The area in which these temperature observations were taken embraces six 1° squares, namely 86° W. to 89° W., and from 26° N. to 28° N.

Monthly and annual sea-surface temperatures in the north central Gulf of Mexico, 1912 to 1933, inclusive

Year[1]	Total number of observations for the year	January	February	March	April	May	June	July	August	September	October	November	December	Annual[1]
1912	534	73.3	71.7	74.6	75.4	79.9	81.2	82.6	83.9	82.7	81.1	75.7	73.3	78.0
1913	407	74.2	74.7	74.7	75.5	76.5	79.4	82.0	82.5	81.6	80.2	76.3	75.7	77.8
1914	322	73.6	73.6	72.4	74.2	76.7	81.0	84.2	84.0	83.1	80.5	75.4	73.0	77.6
1915	238	70.5	68.5	68.0	69.7	77.6	80.5	84.6	84.5	82.7	78.9	78.3	75.2	76.6
1916	196	74.8	74.4	74.5	74.7	77.7	81.6	82.2	83.2	82.8	81.3	76.2	73.8	78.1
1917	103	73	72	75	75	77	81	83	82	81	77	78	72	77.3
1918	40	70	74	74	76	78	81	79	84	84	82	77	74	77.7
1919	136	75	74	73	76	77	81	82	85	83	82	78	74	78.2
1920	432	75.2	74.1	74.9	77.7	79.0	80.9	82.4	82.3	82.8	79.2	74.8	71.5	77.9
1921	571	72.2	71.5	75.6	75.2	76.9	81.2	82.2	83.1	83.0	81.4	78.5	76.2	78.1
1922	739	74.5	73.7	73.9	75.9	79.0	81.0	82.9	83.7	83.0	80.2	78.3	75.8	78.5
1923	769	72.6	72.0	72.4	74.5	77.4	80.1	81.5	82.6	82.9	79.5	74.4	73.2	76.9
1924	912	71.2	69.4	69.2	73.1	77.6	82.8	84.4	85.0	83.8	80.0	76.6	75.5	77.4
1925	1,038	74.2	72.2	74.9	75.2	77.2	80.5	82.7	84.1	83.4	82.1	78.9	74.8	78.4
1926	1,259	73.4	72.5	73.9	75.2	77.3	81.6	83.5	83.8	83.3	82.1	77.9	77.1	78.5
1927	1,469	74.5	75.0	73.3	74.0	78.4	81.2	83.6	84.4	83.6	81.7	77.7	73.9	78.4
1928	1,383	72.6	73.1	74.9	76.0	77.7	80.8	82.6	84.2	83.1	81.6	77.5	75.3	78.3
1929	1,321	74.0	74.2	75.3	77.2	78.3	81.0	81.8	83.0	82.2	78.9	76.5	72.3	77.9
1930	1,195	70.4	70.5	69.6	72.3	77.3	79.5	82.8	83.9	83.0	79.5	75.7	74.4	76.6
1931	1,168	72.7	70.7	70.1	73.1	77.5	81.0	83.8	83.7	83.8	80.9	77.5	78.1	77.7
1932	1,052	76.2	75.3	72.5	74.4	77.6	81.4	84.0	84.2	82.7	80.3	76.5	74.4	78.3
1933	1,098	74.5	75.0	74.7	75.8	79.0	81.4	82.6	83.6	83.0	80.8	78.0	76.3	78.7
Mean (1912–33)[2]	-------	73.3	72.8	73.3	74.8	77.7	81.0	82.7	83.7	82.9	80.5	77.0	74.6	77.8

[1] Values for 1917 to 1919, inclusive, are given to whole degrees, instead of to tenths because of paucity of data.

[2] Computed with monthly values figured to 1 decimal place, and, therefore, not exact means of the figures given here.

DUSTSTORMS, MAY 1935

By W. A. MATTICE

Duststorms and dusty conditions were infrequent during May 1935. Compared with the previous months of March and April, there was very little dust in the air at any time. There were only 84 instances of dusty conditions reported, and 67 of these were of very light intensity. Only two stations reported 10 days with dust, Amarillo, Tex., and Dodge City, Kans., as compared with reports of 28 and 26 days, respectively, during the previous month.

The Weekly Weather and Crop Bulletin of June 4, 1935, illustrates very graphically the reason for the abatement of dusty conditions. The chart of percentage of normal precipitation shows a large area in the western Plains where the rainfall was 200 percent or more of the normal for the month, with most of the central and southern Plains averaging well over 100 percent.

The reports from stations also illustrate the decrease in intensity of dust. The State report from Colorado noted no dusty conditions worthy of mention between the 11th and the 30th, and concludes as follows: "On the whole, these storms were of much less intensity than those of March and April and were not attended by serious damage or discomfort." In Kansas also, the report states that duststorms occurred over western parts up to the 12th, but were not observed again until the last week of the month; they were more or less general in that section on the 31st.

Dust reports were received from only 33 stations, most of them in the central and western Great Plains. From the 8th of the month to the 30th there were no reports of dust east of the Mississippi River. Only 17 instances of visibilities less than 1 mile were noted.

CLIMATOLOGICAL TABLES

CONDENSED CLIMATOLOGICAL SUMMARY

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

Condensed climatological summary of temperature and precipitation by sections, May 1935

[For description of tables and charts, see REVIEW, January, p. 37]

Section	Temperature								Precipitation					
	Section average	Departure from the normal	Monthly extremes						Section average	Departure from the normal	Greatest monthly		Least monthly	
			Station	Highest	Date	Station	Lowest	Date			Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.		In.	In.		In.		In.
Alabama	73.1	+1.8	3 stations	96	[1]15	2 stations	40	1	4.39	+0.46	Robertsdale	10.31	Milltown	1.06
Arizona	63.1	−5.9	Gila Bend	105	23	Alpine	14	6	.46	+.17	Henry's Camp	2.20	6 stations	.00
Arkansas	66.7	−2.3	3 stations	94	[1]12	Dutton	35	7	8.86	+3.79	Conway	16.10	Portland	3.05
California	60.0	−1.3	Cow Creek	107	23	Twin Lakes	4	1	.23	−.75	Giant Forest	2.02	58 stations	.00
Colorado	48.7	−3.4	Cheyenne Wells	94	31	2 stations	8	4	3.74	+1.83	Hawthorne	9.47	Cortez	.41
Florida	77.6	+1.9	2 stations	100	[1]19	4 stations	52	[1]27	3.66	−.39	Cottage Hill	9.40	West Palm Beach	.40
Georgia	72.7	+1.0	5 stations	98	[1]4	Blairsville	33	1	2.91	−.55	Tray Mountain	5.98	Sparta	.61
Idaho	51.2	−1.7	Indian Cove	92	22	Pelton Ranch	15	10	1.23	−.42	Driggs	3.61	Payette	.05
Illinois	57.7	−4.7	Sparta	89	12	3 stations	27	4	7.78	+3.62	Beardstown	12.74	Galena	4.30
Indiana	57.9	−4.2	Rome	93	12	South Bend	29	4	7.01	+2.96	Hazelton	11.38	Albion	3.85
Iowa	55.0	−4.9	2 stations	84	[1]29	Independence	23	4	4.84	+.75	Corydon (near)	10.41	Dumont (near)	1.51
Kansas	59.0	−4.7	Ashland	98	11	Burr Oak	27	5	7.78	+4.01	Chanute	17.29	Richfield	1.63
Kentucky	63.5	−1.8	Murray	91	[1]13	2 stations	36	1	7.40	+3.36	Hazard	11.09	Fords Ferry	3.99
Louisiana	74.5	+.8	2 stations	95	[1]30	do	47	7	7.81	+3.20	Simmesport	21.17	Houma	1.30
Maryland-Delaware	59.5	−2.9	Cumberland, Md	92	28	Sines, Md	28	[1]18	3.63	+.22	Salisbury, Md	5.85	Rock Hall, Md	2.01
Michigan	49.8	−4.0	Midland	85	20	Dukes	13	1	2.70	−.50	Albion	8.66	Roscommon No. 2	.11
Minnesota	51.5	−3.5	Red Lake Falls	83	20	2 stations	23	[1]3	2.39	−.78	Bird Island	6.58	Gonvick	1.00
Mississippi	72.5	+.8	Columbia	96	31	do	44	25	5.93	+1.50	Woodville	12.34	Swan Lake	3.09
Missouri	60.3	−4.0	Caruthersville	92	12	do	32	[1]4	8.50	+3.69	Farmington	13.36	Cape Girardeau	5.18
Montana	48.7	−2.9	Superior	88	22	Summit	0	7	1.66	−.54	Mystic Lake	5.43	Haugan	.12
Nebraska	52.7	−6.3	2 stations	89	[1]11	Merriman	21	[1]3	6.24	+2.71	Hebron	14.65	Santee	2.37
Nevada	55.6	+.2	Logandale	101	[1]23	San Jacinto	11	8	1.18	+.30	Lamoille	4.16	Beatty	.00
New England	52.4	−2.6	Turner's Falls, Mass.	91	30	Chelsea, Vt	22	23	2.12	−1.21	Pittsburg, N. H	4.54	2 stations	1.05
New Jersey	57.8	−2.6	Burlington	95	30	Canoe Brook	27	24	1.71	−2.02	Burlington	3.49	Culvers Lake	.51
New Mexico	55.4	−4.1	Portales Evap. Station.	101	31	Selsor Ranch	8	5	2.35	+1.20	Tijeras Ranger Station.	6.55	Oro Grande	.22
New York	51.5	−4.3	Scarsdale	91	29	Indian Lake	20	[1]3	2.53	−.95	Salisbury	4.64	Scarsdale	1.10
North Carolina	65.5	−1.3	2 stations	96	14	2 stations	29	[1]1	3.47	−.70	Parker	8.69	Wilmington	.97
North Dakota	49.5	−3.3	Towner	89	31	Howard	30	4	2.66	+.26	Dogden Butte	4.03	Cavalier	1.41
Ohio	56.3	−4.1	Portsmouth	89	[1]9	Holgate	28	1	4.88	+1.19	Peebles (near)	9.28	Cleveland	1.87
Oklahoma	64.9	−3.2	Beaver	97	11	Boise City	29	4	7.48	+2.74	Antlers	15.51	Boise City	2.17

[1] Other dates also

Condensed climatological summary of temperature and precipitation by sections, May 1935—Continued

Section	Temperature								Precipitation					
			Monthly extremes								Greatest monthly		Least monthly	
	Section average	Departure from the normal	Station	Highest	Date	Station	Lowest	Date	Section average	Departure from the normal	Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.		In.	In.		In.		In.
Oregon	52.5	−.6	Umatilla	92	28	Crater Lake	11	18	.64	−1.10	Headworks	2.56	2 stations	.02
Pennsylvania	56.0	−3.4	Phoenixville	92	[1] 28	Bellefonte	21	24	3.00	−.90	Lycippus	6.09	Mount Pocono	.76
South Carolina	70.7	−.2	Garnett	99	31	Long Creek	36	1	2.58	−1.04	Charleston	7.09	Edgefield	.55
South Dakota	51.1	−5.2	Vale	83	10	Vale	22	4	2.85	−.13	Hot Springs	9.65	De Smet	.90
Tennessee	67.2	+.4	Etowah	95	13	2 stations	33	25	4.78	+.63	Memphis	8.09	Copperhill	2.36
Texas	71.1	−2.0	3 stations	102	[1] 1	5 stations	31	[1] 4	7.20	+3.49	Hondo	22.40	Clint	.03
Utah	52.4	−2.8	2 stations	92	[1] 23	2 stations	16	[1] 4	2.11	+.89	High Line City Creek.	5.27	Thompsons	.27
Virginia	61.8	−2.2	Danville	91	3	Burkes Garden	29	1	3.69	−.11	Rose Hill	6.77	Balcony Falls	1.66
Washington	54.4	.0	Wahluke (near)	95	21	3 stations	21	[1] 1	.59	−1.38	Snoqualmie Pass	3.19	White Swan	.00
West Virginia	59.2	−2.4	Martinsburg	92	28	Pickens	26	[1] 1	6.07	+2.05	Spencer	8.31	Harpers Ferry	2.14
Wisconsin	51.1	−4.0	Marinette	87	26	Long Lake	17	[1] 1	2.52	−1.08	Beloit	5.81	Oconto	.45
Wyoming	45.2	−4.1	2 stations	80	25	Dome Lake	−2	8	3.68	+1.56	Middle Forks (near)	8.82	Crandall Creek (near)	.80
Alaska (April)	29.9	+1.7	Haines	68	4	Allakaket	−26	12	1.47	+.01	Cordova	6.74	Barrow	T
Hawaii	72.8	+1.0	Mahukona	91	26	Kanaiohuluhulu	43	[1] 1	3.35	−2.45	Puohakamoa No. 2	16.20	9 stations	.00
Puerto Rico	75.8	−1.1	3 stations	93	18	Guineo Reservoir	49	6	7.93	+1.38	La Mina	18.21	Aibonito	3.68

[1] Other dates also.

TABLE 1.—*Climatological data for Weather Bureau stations, May 1935*

[Compiled by Annie E. Small, by official authority, U. S. Weather Bureau]

District and station	Elevation of instruments			Pressure			Temperature of the air										Mean wet thermometer	Mean temperature of the dew point	Mean relative humidity	Precipitation			Wind						Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
	Barometer above sea level	Thermometer above ground	Anemometer above ground	Station, reduced to mean of 24 hours	Sea level, reduced to mean of 24 hours	Departure from normal	Mean max. + mean min. ÷ 2	Departure from normal	Maximum	Date	Mean maximum	Minimum	Date	Mean minimum	Greatest daily range					Total	Departure from normal	Days with 0.01, or more	Total movement	Prevailing direction	Maximum velocity: Miles per hour	Maximum velocity: Direction	Maximum velocity: Date						
	Ft.	Ft.	Ft.	In.	In.	In.	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	°F.	°F.	%	In.	In.		Miles								0–10	In.	In.
New England							53.0	−1.6											65	1.70	−1.4										5.5		
Eastport	76	67	85	29.80	29.88	−0.08	47.4	−0.3	69	26	55	32	3	40	26	43	39	76	1.05	−2.0	10	6,700	sw.	27	sw.	1	5	15	11	6.0	0.0	0.0
Greenville, Maine	1,070	6	40	28.74	29.90	.....	46.8	.....	82	27	58	25	5	36	45	.....	.....	.....	.....	2.55	.....	17	5,164	nw.	24	.....	1	4	7	20	.....	T	.0
Portland, Maine	103	82	117	29.81	29.93	−.04	53.5	+.2	81	28	62	35	3	45	26	45	36	54	1.38	−2.0	7	7,071	nw.	30	nw.	1	15	11	5	4.3	.0	.0
Concord	289	60	.....	.....	.....	.....	53.0	−1.3	85	27	65	30	5	41	42	.....	.....	.....	.....	1.89	−1.1	5	.....	nw.	.....	.....	.....	11	11	9	.....	.0	.0
Burlington	403	11	48	29.52	29.96	−.01	50.5	−6.0	82	27	60	31	23	41	38	.....	.....	.....	.....	2.31	−.5	11	6,846	nw.	34	s.	9	7	13	11	6.1	T	.0
Northfield	876	12	60	29.01	29.97	.00	48.0	−4.8	81	27	60	25	23	36	46	44	37	63	2.36	−.4	13	5,943	n.	23	sw.	5	5	14	12	6.4	T	.0
Boston	124	336	360	29.81	29.95	−.03	55.5	−1.6	85	27	64	37	3	47	29	47	39	57	1.35	−1.8	9	10,536	w.	47	w.	1	8	13	10	5.5	.0	.0
Nantucket	12	14	90	29.95	29.96	−.03	51.8	−.5	68	25	58	41	5	46	23	47	43	76	2.41	−.4	12	9,963	sw.	37	sw.	1	15	5	11	4.8	.0	.0
Block Island	26	11	46	29.94	29.96	−.03	52.6	−.2	72	27	59	40	5	46	21	48	45	81	1.17	−2.3	11	10,053	sw.	34	w.	1	11	10	10	5.6	.0	.0
Providence	160	215	251	29.79	29.96	−.02	56.9	−1.6	86	29	66	40	4	47	32	48	38	53	1.51	−1.4	10	8,469	nw.	43	nw.	1	12	11	8	4.8	.0	.0
Hartford	159	70	104	.....	29.97	−.01	57.2	−.3	86	29	68	39	5	47	36	.....	.....	.....	.....	1.60	−2.0	9	6,159	s.	.....	.....	.....	10	11	10	.....	.0	.0
New Haven	106	74	153	29.87	29.98	−.01	57.0	−.9	89	29	66	40	5	48	31	49	41	60	1.70	−2.0	9	6,008	s.	24	w.	1	8	9	14	6.0	.0	.0
Middle Atlantic States							59.8	−2.5											63	2.49	−1.0										6.0		
Albany	972	97	112	29.87	29.97	−.01	56.2	−3.1	86	27	66	35	3	46	35	48	41	61	2.35	−.6	10	5,337	s.	23	s.	9	11	12	8	5.5	T	.0
Binghamton	871	60	68	29.07	30.01	+.03	52.2	−5.2	81	27	63	32	16	41	40	.....	.....	.....	.....	1.91	−1.4	12	4,696	nw.	20	nw.	1	4	12	15	7.1	T	.0
New York	314	415	454	29.64	29.98	−.01	58.8	−1.8	86	29	67	44	5	50	26	50	42	60	1.33	−1.9	9	10,248	n.	49	nw.	29	10	8	13	6.0	.0	.0
Bellefonte	1,050	5	42	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Harrisburg	374	94	104	29.60	30.00	+.02	59.3	−2.5	86	28	69	41	16	50	31	50	42	57	1.42	−2.0	11	5,492	nw.	21	nw.	7	6	13	12	6.2	.0	.0
Philadelphia	114	168	367	29.84	30.01	+.02	60.6	−2.3	86	28	69	45	1	52	25	52	44	60	2.21	−1.0	11	8,886	n.	34	nw.	7	8	9	14	6.1	.0	.0
Reading	323	283	306	29.65	30.00	.....	59.4	−3.1	87	28	68	42	24	50	27	50	42	56	.99	−2.7	10	7,752	nw.	35	n.	31	7	15	9	6.0	.0	.0
Scranton	805	72	104	29.14	30.00	+.02	55.0	−4.4	82	27	65	35	24	45	34	47	38	56	2.84	−.4	12	5,072	nw.	34	nw.	7	9	14	8	5.8	.0	.0
Atlantic City	52	37	172	29.94	30.00	+.02	56.8	−1.3	74	27	64	44	16	50	25	52	48	74	2.14	−.9	13	10,194	s.	31	w.	7	6	9	16	6.7	.0	.0
Sandy Hook	22	10	57	29.96	29.98	.....	57.8	.....	85	28	65	44	2	50	25	50	45	68	1.61	−2.1	9	9,059	s.	44	nw.	29	10	8	13	5.5	.0	.0
Trenton	190	88	106	29.79	29.99	.....	59.0	−2.1	87	29	69	42	24	49	32	50	42	58	1.47	−1.6	10	6,583	n.	21	w.	18	9	10	12	6.1	.0	.0
Baltimore	123	100	215	29.88	30.01	+.02	62.2	−2.2	89	29	71	46	24	54	29	53	45	58	4.51	+1.0	14	7,309	sw.	31	se.	22	8	9	14	6.1	.0	.0
Washington	112	62	85	29.89	30.01	+.01	61.8	−1.9	89	28	71	44	24	52	32	54	47	62	3.54	−.2	12	4,871	nw.	23	nw.	22	8	10	13	5.7	.0	.0
Cape Henry	18	8	54	29.99	30.01	.....	63.4	−.8	88	7	71	49	5	56	29	57	53	73	2.37	−1.2	8	8,138	sw.	31	ne.	15	9	10	12	5.7	.0	.0
Lynchburg	686	5	.....	29.29	30.03	+.03	64.2	−3.1	88	28	77	41	5	51	41	.....	.....	.....	.....	3.26	−.4	19	.....	sw.	.....	.....	1	24	6	.....	.0	.0
Norfolk	91	80	125	29.93	30.03	+.03	65.0	−1.2	86	14	74	48	5	56	29	57	52	68	2.89	−.9	10	7,015	sw.	31	w.	7	8	5	18	6.5	.0	.0
Richmond	144	11	52	29.87	30.02	+.03	63.8	−2.7	86	2	74	44	1	53	33	56	51	69	3.81	.0	14	5,575	sw.	31	nw.	2	11	8	12	5.5	.0	.0
Wytheville	2,304	49	55	.....	29.99	.00	59.8	−1.6	82	3	70	38	1	49	33	.....	.....	.....	72	3.65	.0	17	4,455	w.	23	w.	2	10	9	12	.....	.0	.0
South Atlantic States							70.5	+0.3											73	3.44	0.0										5.6		
Asheville	2,253	89	104	27.70	30.02	+.03	63.9	+1.3	88	2	75	38	1	52	37	56	53	74	3.06	−.4	13	5,572	se.	22	s.	6	6	12	13	6.5	.0	.0
Charlotte	779	63	86	29.20	30.02	+.03	68.0	−.9	89	14	78	47	25	58	28	60	56	71	3.74	+.1	13	5,215	ne.	26	nw.	14	7	11	13	6.0	.0	.0
Greensboro	886	6	56	29.08	30.03	.....	64.0	.....	88	3	75	43	25	53	32	58	55	76	4.94	.....	15	5,682	sw.	27	nw.	14	8	8	15	6.2	.0	.0
Hatteras	11	5	50	.....	30.01	.00	67.1	−1.6	79	14	73	54	25	61	19	.....	.....	83	2.56	−1.2	9	9,516	sw.	32	nw.	14	13	9	9	.....	.0	.0
Raleigh	376	103	146	29.61	30.01	+.02	66.5	−2.0	89	3	77	46	25	56	28	60	56	72	3.61	−.2	9	6,144	sw.	25	nw.	23	9	11	11	5.6	.0	.0
Wilmington	72	73	107	29.96	30.03	+.02	69.1	−1.7	91	14	78	51	17	60	27	63	60	75	.97	−2.5	7	6,968	sw.	30	s.	2	11	9	11	5.1	.0	.0
Charleston	48	11	92	29.98	30.03	+.02	73.6	+.9	95	14	81	55	25	66	24	67	64	75	7.09	+4.0	10	7,849	sw.	27	n.	24	5	14	12	6.2	.0	.0
Columbia, S. C.	351	41	57	29.64	30.01	+.01	72.2	+.3	92	31	83	52	26	62	32	63	59	68	2.46	−.6	8	5,370	ne.	24	nw.	15	11	10	10	5.1	.0	.0
Greenville, S. C.	1,039	139	.....	.....	.....	.....	68.4	+1.2	89	14	78	48	25	59	33	.....	.....	.....	4.21	+.2	13	.....	sw.	.....	.....	.....	10	10	11	.....	.0	.0
Augusta	182	62	77	29.81	30.00	+.01	73.7	+1.3	96	31	85	51	1	62	32	64	58	62	2.93	−.1	6	4,508	nw.	21	n.	11	7	16	8	5.4	.0	.0
Savannah	65	73	152	29.95	30.02	+.02	75.5	+2.1	94	15	84	57	18	66	26	67	64	74	1.89	−1.1	10	7,540	s.	24	n.	16	11	10	10	5.1	.0	.0
Jacksonville	43	86	110	29.98	30.02	+.02	77.0	+2.0	93	16	86	61	26	68	24	68	65	73	5.28	+1.3	7	5,555	s.	34	sw.	23	11	13	7	4.7	.0	.0

TABLE 1.—*Climatological data for Weather Bureau stations, May 1935*—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷ 2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01, or more	Wind: Total movement	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
	Ft.	Ft.	Ft.	In.	In.	In.	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	°F.	%	In.	In.		Miles								0–10	In.	In.
Florida Peninsula							80.6	+3.3										70	1.69	−2.6										3.8		
Key West	22	10	64	29.96	29.98	+.01	82.1	+3.0	92	22	88	72	16	77	16	74	71	71	.50	−3.0	6	7,307	se.	21	e.	27	13	18	0	3.7	.0	.0
Miami	25	124	168	29.99	30.02	+.03	80.2	+3.8	91	24	85	69	14	76	14	72	69	69	1.06	−5.2	6	7,418	se.	23	s.	24	10	17	4	4.5	.0	.0
Tampa	35	88	197	29.98	30.01	+.02	79.4	+3.1	94	4	89	65	27	70	25	70	67	71	3.51	+.5	6	7,611	se.	30	n.	21	18	11	2	3.3	.0	.0
Titusville	43	5	36	29.97	30.02	.....	76.8	.....	94	23	88	60	3	66	29	.....	.....	.....	4.50	.....	9	.....	e.	.....	.....	.....	14	10	7	.....	.0	.0
East Gulf States							73.7	+1.3										74	5.29	+1.4										5.3		
Atlanta [1]	1,173	128	135	28.99	29.99	.00	70.4	+.5	89	14	82	44	1	59	38	63	59	71	3.30	−.2	11	5,131	s.	33	sw.	6	7	14	10	5.4	.0	.0
Macon	370	79	87	29.62	30.01	+.02	73.4	+1.1	93	31	85	46	1	62	36	64	59	64	1.25	−1.7	8	4,739	s.	32	sw.	6	11	11	9	5.0	.0	.0
Thomasville	273	49	58	29.74	30.03	+.04	74.1	+.1	90	5	84	55	27	64	30	68	66	78	5.21	+1.6	9	.....	sw.	.....	.....	.....	9	12	10	.....	.0	.0
Apalachicola	35	11	.....	29.97	30.01	.....	76.2	.....	89	21	83	62	25	70	19	71	.....	.....	7.55	+4.2	7	.....	s.	.....	.....	.....	9	16	6	.....	.0	.0
Pensacola	56	149	185	29.94	30.00	+.01	75.1	+1.2	86	16	80	58	25	70	21	70	68	79	7.10	+3.7	10	8,993	se.	31	s.	20	17	10	4	3.8	.0	.0
Anniston	741	9	.....	.....	.....	.....	71.6	+3.2	91	31	83	44	1	60	38	.....	.....	.....	3.81	−.1	6	.....	s.	.....	.....	.....	12	12	7	.....	.0	.0
Birmingham	700	11	48	29.24	29.99	+.01	72.0	+.9	91	31	82	48	25	62	30	64	61	74	4.66	+.7	10	4,947	s.	42	se.	20	8	13	10	5.6	.0	.0
Mobile	57	125	161	29.92	29.98	−.01	75.4	+1.0	90	16	82	56	25	68	23	70	67	80	7.50	+3.2	9	6,942	se.	26	s.	6	11	13	7	4.8	.0	.0
Montgomery	218	92	105	29.76	30.00	+.01	74.8	+1.4	92	15	85	55	26	65	28	66	62	69	2.89	−1.0	8	4,941	se.	24	sw.	19	9	9	13	6.1	.0	.0
Meridian	375	67	92	29.59	29.98	.00	73.4	+2.1	93	31	84	51	26	63	31	66	63	75	5.75	+1.4	7	4,452	s.	22	se.	20	12	11	8	5.0	.0	.0
Vicksburg	247	65	73	29.71	29.96	−.01	73.2	+.3	92	31	82	56	25	65	25	66	64	77	9.85	+5.5	8	5,242	se.	27	w.	2	5	14	12	6.5	.0	.0
New Orleans	53	76	84	29.92	29.97	.00	77.8	+2.4	91	20	85	61	25	71	20	71	68	76	4.57	.0	6	5,082	se.	19	se.	18	10	15	6	5.1	.0	.0
West Gulf States							71.6	−1.7										79	7.03	+3.0										6.1		
Shreveport	249	92	227	29.67	29.94	−.01	71.6	−2.0	89	31	80	53	6	63	25	66	63	78	10.47	+6.2	12	7,659	s.	34	se.	18	9	10	12	5.7	.0	.0
Bentonville	1,303	11	44	28.38	29.94	+.01	62.5	−3.9	87	31	70	42	5	54	32	.....	.....	19	8.76	.....	19	4,906	s.	21	se.	18	1	11	19	.....	.....	.....
Fort Smith	457	79	94	29.44	29.92	−.01	66.6	−3.0	92	31	75	47	7	59	33	60	57	77	6.25	+1.4	14	6,044	e.	23	e.	19	2	10	19	7.4	.0	.0
Little Rock	357	94	102	29.59	29.96	+.01	67.0	−3.3	88	31	75	45	4	59	25	61	58	78	10.34	+5.6	13	5,954	s.	30	sw.	18	3	10	18	7.3	.0	.0
Austin	605	136	148	29.26	29.88	.....	72.0	−2.6	89	30	81	47	5	63	33	65	62	76	9.21	+4.6	16	6,732	se.	44	nw.	9	8	12	11	6.0	.0	.0
Brownsville	57	88	96	29.77	29.83	.....	79.2	+.6	92	19	86	55	5	72	24	73	71	83	1.64	−.6	6	9,737	se.	31	ne.	10	5	20	6	5.5	.0	.0
Corpus Christi	20	11	78	29.84	29.86	−.04	77.2	+1.0	88	18	82	54	5	72	21	72	70	82	4.97	+1.8	9	10,019	se.	39	se.	18	6	17	8	5.6	.0	.0
Dallas	512	220	227	29.36	29.90	.....	68.2	.....	86	28	76	45	5	61	25	63	62	79	6.84	+2.4	12	9,578	se.	44	sw.	14	8	5	18	6.5	.0	.0
Fort Worth	679	92	110	29.19	29.90	−.01	69.5	−2.8	89	30	78	44	5	61	31	.....	.....	.....	9.15	+4.5	9	8,086	s.	55	w.	14	9	10	12	5.9	.0	.0
Galveston	54	106	114	29.86	29.92	−.02	75.8	+1.0	87	20	80	56	6	72	17	71	69	83	.71	−2.7	4	9,224	s.	34	se.	18	10	12	9	5.3	.0	.0
Houston	138	292	314	29.77	29.92	.....	74.0	−1.5	90	30	82	52	6	66	23	.....	.....	.....	4.30	−.2	11	9,492	se.	54	se.	18	7	14	10	5.6	.0	.0
Palestine	510	64	72	29.40	29.92	−.01	70.8	−1.9	87	30	70	49	5	62	26	65	62	79	8.83	+4.3	11	6,085	s.	24	nw.	15	7	10	14	6.1	.0	.0
Port Arthur	34	58	66	.....	29.92	.....	76.2	.....	89	20	82	56	6	70	22	.....	.....	.....	4.66	+.5	6	5,784	se.	34	nw.	5	10	17	4	.....	.0	.0
San Antonio	693	242	301	29.14	29.85	−.05	72.6	−2.5	92	20	82	47	5	63	30	66	64	78	14.07	+10.9	14	9,892	e.	47	nw.	18	6	11	14	6.1	.0	.0
Ohio Valley and Tennessee							62.2	−2.8										69	6.20	+2.4										6.5		
Chattanooga	762	71	214	29.20	30.00	+0.0	170.4	+1.6	90	31	81	45	1	60	35	63	58	70	5.68	+1.9	12	5,489	w.	31	n.	10	9	13	9	5.2	0.0	0.0
Knoxville	995	66	84	28.96	30.00	+.01	67.8	+.6	86	13	78	45	25	58	34	60	56	71	4.46	+.7	17	4,266	ne.	25	w.	20	9	16	6	5.2	.0	.0
Memphis	399	78	86	29.55	29.96	.00	68.2	−2.4	88	12	76	47	4	60	25	62	59	73	8.09	+3.9	14	4,989	sw.	30	sw.	2	4	12	15	6.5	.0	.0
Nashville	546	168	191	29.43	30.01	+.03	67.2	−1.0	86	13	77	47	25	58	30	61	57	70	3.51	−.4	13	6,649	sw.	30	nw.	2	3	14	14	7.0	.0	.0
Lexington	989	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Louisville	525	188	234	29.45	30.03	+.05	62.2	−4.4	85	12	71	40	4	53	31	55	51	71	8.64	+4.9	18	7,511	n.	40	w.	2	6	8	17	6.8	.0	.0
Evansville	431	76	116	29.53	30.00	+.03	63.4	−3.3	85	13	72	40	4	55	29	56	52	71	9.96	+6.1	17	6,462	ne.	32	sw.	28	4	9	18	7.2	.0	.0
Indianapolis	822	194	230	29.14	30.03	+.06	58.0	−4.9	80	28	66	34	4	50	32	51	44	64	6.97	+3.1	17	8,237	e.	32	w.	3	6	9	16	7.0	.0	.0
Terre Haute	575	96	129	29.38	30.00	.....	60.4	.....	85	12	70	36	4	51	29	54	49	71	7.29	+3.4	19	6,870	ne.	33	se.	1	5	7	19	7.1	.0	.0
Cincinnati	627	11	51	29.35	30.03	+.04	59.8	−3.3	82	28	69	36	4	50	37	52	47	68	4.87	+1.2	17	5,414	ne.	24	sw.	3	6	6	19	7.0	.0	.0
Columbus	822	90	210	29.16	30.03	+.05	58.0	−4.3	83	28	68	36	4	48	34	51	44	64	4.71	+1.1	14	6,224	ne.	33	sw.	28	9	6	16	6.1	.0	.0
Dayton	900	58	153	29.06	30.01	.....	58.7	−3.9	83	28	68	36	4	50	34	.....	.....	.....	5.74	+2.1	14	6,093	ne.	30	sw.	28	7	8	16	.....	.0	.0
Elkins	1,947	59	78	28.01	30.05	+.05	56.4	−2.8	83	28	68	33	19	44	40	50	45	71	6.42	+2.4	15	4,355	nw.	20	w.	7	6	7	18	7.0	.0	.0
Parkersburg	637	77	84	29.40	30.05	+.06	59.7	−4.1	85	28	70	37	1	49	35	53	47	68	6.41	+3.0	15	4,377	nw.	26	nw.	9	9	8	14	6.2	.0	.0
Pittsburgh	842	164	410	29.13	30.03	+.04	58.8	−3.6	85	28	69	40	1	48	33	50	43	60	4.07	+.9	12	6,906	nw.	31	nw.	21	7	8	16	6.6	.0	.0
Lower Lake Region							52.3	−5.1										66	2.69	−0.5										5.6		
Buffalo	768	243	280	29.19	30.03	+0.6	49.4	−5.2	73	28	56	32	3	43	26	45	40	71	2.08	−1.0	8	9,251	sw.	37	w.	1	10	11	10	5.4	.0	.0
Canton	448	10	61	29.49	29.97	.....	50.3	−5.9	78	26	61	28	3	40	31	.....	.....	.....	2.27	−.7	13	6,449	w.	32	sw.	10	4	16	11	6.1	T	.0
Ithaca	836	77	100	29.10	30.01	.....	51.9	−5.6	82	26	62	32	16	41	39	47	40	65	2.22	−1.2	10	6,343	nw.	34	s.	9	5	14	12	6.5	.0	.0
Oswego	335	71	85	29.64	30.01	+.04	49.6	−5.6	76	27	57	34	3	43	26	44	38	67	2.22	−.8	10	6,890	w.	28	w.	1	11	10	10	5.2	.0	.0
Rochester	523	86	102	29.46	30.03	+.06	52.6	−4.5	79	27	61	33	3	44	29	46	38	59	2.54	−.4	8	6,360	nw.	28	w.	10	15	9	7	4.3	.0	.0
Syracuse	596	65	79	29.38	30.02	+.04	52.6	−4.7	82	27	61	34	3	44	32	.....	.....	.....	2.48	−.5	9	5,780	nw.	23	nw.	1	13	8	10	5.2	.0	.0
Erie	714	130	166	29.26	30.04	+.06	51.9	−4.9	82	28	59	35	4	45	29	46	40	67	2.20	−1.2	11	7,689	w.	32	w.	9	14	4	13	5.4	.0	.0
Cleveland	762	267	337	29.22	30.05	+.07	53.4	−4.5	82	28	60	36	4	47	23	46	40	66	1.87	−1.2	10	8,334	n.	33	sw.	29	11	5	15	5.7	.0	.0
Sandusky	629	5	67	29.37	30.05	+.07	54.4	−4.8	84	28	63	37	4	46	31	.....	.....	.....	3.58	+.4	12	6,248	ne.	22	ne.	3	8	7	16	6.2	.0	.0
Toledo	628	79	87	29.38	30.07	+.10	54.0	−5.4	82	28	63	33	1	46	29	47	41	64	2.75	−.7	13	6,918	e.	27	e.	3	12	7	12	5.3	.0	.0
Fort Wayne	857	69	84	29.12	30.05	.....	55.2	−5.0	80	28	64	34	4	47	24	49	44	70	4.50	+.6	13	6,376	ne.	27	sw.	28	9	9	13	6.0	.0	.0
Detroit [1]	626	5	78	29.38	30.07	+.10	52.6	−5.4	80	26	62	32	1	43	31	46	40	66	3.61	+.4	11	6,693	ne.	28	nw.	28	10	5	16	6.4	.0	.0
Upper Lake Region							49.6	−3.1										65	2.52	−0.8										5.6		
Alpena	609	13	89	29.42	30.09	+.12	48.4	−2.1	74	28	57	29	1	39	29	43	36	63	.81	−2.2	6	7,736	nw.	30	e.	3	16	7	8	4.3	3.3	.0
Escanaba	612	54	60	29.44	30.11	+.14	48.4	−1.2	72	20	57	27	1	40	30	42	36	63	1.65	−1.3	8	7,464	s.	30	n.	13	14	8	9	4.7	.0	.0
Grand Rapids	707	70	244	29.30	30.07	+.10	53.3	−4.7	75	31	63	31	1	44	29	46	38	61	4.33	+.9	11	7,446	e.	32	ne.	3	11	6	14	6.0	.4	.0
Lansing	878	6	88	29.11	30.07	.....	51.1	−5.8	77	26	61	29	1	41	32	47	42	72	3.88	+.5	12	6,240	ne.	24	ne.	3	10	7	14	6.2	.1	.0
Ludington	637	5	54	29.38	30.09	.....	48.6	−3.6	69	19	58	27	1	39	27	43	.....	.....	1.20	−1.8	10	.....	n.	.....	.....	.....	12	6	13	.....	4.3	.0
Marquette	734	77	111	29.30	30.12	+.15	47.0	−2.0	76	26	54	29	1	40	31	42	35	66	1.44	−1.5	8	5,945	n.	28	s.	8	11	13	7	5.0	.0	.0
Sault Ste. Marie	614	11	52	29.40	30.11	+.16	46.2	−2.8	79	26	56	29	6	37	38	41	33	61	1.12	−1.9	5	6,477	nw.	26	nw.	21	14	9	8	4.3	.0	.0
Chicago	673	7	131	29.33	30.06	+.10	52.0	−5.5	76	26	58	36	3	46	26	46	41	71	7.09	+3.6	13	7,809	ne.	29	e.	3	8	7	16	6.5	T	.0
Green Bay	617	109	141	29.42	30.08	+.13	52.0	−2.9	80	25	61	31	4	43	31	45	37	60	1.46	−2.1	11	7,551	ne.	31	ne.	3	7	6	18	6.6	1.0	.0
Milwaukee	681	97	221	29.34	30.08	+.12	50.4	−3.7	76	26	56	31	4	44	20	45	38	66	2.29	−1.1	11	9,090	n.	32	n.	3	6	8	17	6.6	3.2	.0
Duluth	1,133	5	47	28.86	30.09	+.13	47.9	+.6	78	25	57	29	4	39	35	41	34	66	1.85	−1.4	6	8,840	ne.	36	ne.	2	8	11	12	6.1	.0	.0
North Dakota							50.1	−4.0										66	2.16	−0.2										7.0		
Moorehead, Minn	940	50	58	29.03	30.06	+.12	51.6	−3.5	79	20	62	30	2	41	35	45	36	60	1.81	−1.1	9	7,043	e.	26	se.	1	5	11	15	6.9	5.1	.0
Bismarck	1,674	8	57	28.25	30.05	+.13	50.1	−4.4	74	20	59	32	3	41	32	44	38	67	2.25	−.1	15	7,599	se.	30	ne.	10	3	11	17	7.3	1.8	.0
Devils Lake	1,478	11	44	28.49	30.08	+.14	49.5	−3.1	78	20	59	31	10	40	33	43	37	67	2.16	+.1	12	7,021	se.	26	ne.	11	4	10	17	7.4	.1	.0
Grand Forks	833	12	67	.....	.....	.....	51.4	.....	80	20	63	29	10	40	36	45	.....	.....	1.61	.....	12	.....	se.	28	se.	1	1	20	10	.....	T.	.0
Williston	1,878	41	48	28.05	30.04	+.11	49.2	−4.8	74	24	57	31	4	41	30	44	38	71	2.42	+.4	16	7,284	se.	32	se.	10	8	6	17	6.6	1.6	.0

[1] Observations taken at airport.

TABLE 1.—*Climatological data for Weather Bureau stations, May 1934*—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷ 2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01, or more	Wind: Total movement	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
Upper Mississippi Valley	*Ft.*	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	°F.	%	*In.*	*In.*		*Miles*								*0–10*	*In.*	*In.*
							56.8	−4.8										70	5.70	+1.6										7.3		
Minneapolis	918	102	208	29.07	30.06	.....	54.9	−2.8	75	21	63	32	1	46	26	47	38	58	3.81	+0.1	9	7,917	e.	30	se.	1	3	12	16	6.8	3.0	.0
La Crosse	714	11	48	29.28	30.05	+0.11	54.6	−4.7	79	21	65	28	4	45	33	48	41	64	5.09	+1.3	10	4,082	e.	16	e.	1	5	7	19	7.1	6.6	.0
Madison	974	70	78	29.01	30.07	+.11	52.5	−5.1	76	25	60	30	4	45	26	46	41	69	3.09	−.8	11	6,434	ne.	26	n.	3	5	8	18	7.0	5.0	.0
Charles City	1,015	10	51	28.96	30.04	+.10	54.3	−3.5	77	21	64	32	3	45	33	48	41	65	2.72	−1.6	12	5,405	e.	23	e.	1	7	9	15	6.3	1.4	.0
Davenport	606	66	161	29.38	30.04	+.09	56.1	−5.2	79	29	64	33	3	48	28	50	45	69	6.55	+2.6	16	7,381	ne.	28	ne.	3	5	4	22	7.6	.1	.0
Des Moines	861	5	99	29.11	30.02	+.09	56.0	−5.3	76	29	64	32	4	48	31	50	46	73	7.18	+2.6	18	7,116	e.	27	se.	1	4	6	21	7.7	.0	.0
Dubuque	700	60	79	29.30	30.05	+.10	55.4	−4.9	78	21	64	31	4	47	32	48	42	65	3.95	−.3	12	4,961	e.	21	e.	2	7	6	18	6.8	1.3	.0
Keokuk	614	64	78	29.35	30.02	+.08	57.2	−6.6	81	12	65	35	4	50	26	52	48	75	7.28	+3.4	19	5,550	e.	23	n.	13	4	3	24	8.0	.0	.0
Cairo	358	87	93	29.60	29.98	+.02	65.2	−3.2	86	12	73	41	4	57	27	60	56	77	4.83	+1.1	14	6,514	s.	38	sw.	2	2	7	22	7.8	.0	.0
Peoria	609	11	45	29.37	30.04	+.08	55.8	−5.9	80	12	64	34	4	47	32	51	47	75	8.58	+4.5	19	5,457	ne.	21	ne.	3	8	5	18	6.8	.0	.0
Springfield, Ill	636	5	191	29.33	30.00	+.05	58.8	−4.4	83	12	67	37	4	50	26	53	50	76	7.91	+3.5	21	8,133	ne.	38	sw.	8	5	6	20	7.7	.0	.0
St. Louis	568	265	303	29.38	29.99	+.04	61.4	−5.5	82	30	69	39	4	54	24	55	52	77	7.35	+3.0	19	8,320	e.	32	sw.	28	2	10	19	7.7	.0	.0
Missouri Valley							57.3	−4.8										76	6.69	+2.6										7.6		
Columbia, Mo	784	6	84	29.13	29.97	+.03	59.9	−4.4	84	12	68	39	4	52	29	.....	.....	.....	8.19	+3.7	22	5,752	ne.	25	nw.	12	2	12	17	7.4	.0	.0
Kansas City [1]	750	32	45	29.15	29.96	+.04	59.8	−5.0	89	12	68	39	4	52	29	55	52	81	9.99	+5.3	22	6,787	ne.	34	nw.	1	1	8	22	7.3	.0	.0
St. Joseph	967	11	49	28.93	29.97	.....	58.2	.....	80	12	66	39	4	51	29	53	50	79	7.92	+3.7	20	6,064	se.	27	n.	8	3	9	19	7.7	.0	.0
Springfield, Mo	1,324	98	104	28.56	29.95	+.02	60.7	−3.8	86	8	68	39	4	53	29	56	52	80	6.81	+1.6	17	7,182	s.	32	se.	19	6	8	17	7.0	.0	.0
Iola	984	11	50	28.90	29.93	+.01	61.9	−3.3	84	12	70	40	4	53	29	.....	.....	.....	12.10	+7.4	21	.....	se.	.....	.....	.....	1	9	21	.....	.0	.0
Topeka	987	65	87	.....	.....	.....	59.4	−4.9	90	12	68	38	4	51	34	.....	.....	.....	11.08	+6.6	17	7,082	e.	34	s.	12	2	14	15	7.4	.0	.0
Lincoln	1,189	11	81	28.71	29.98	+.07	55.7	−6.0	79	10	64	32	5	48	39	51	47	79	5.44	+1.4	15	7,300	n.	26	e.	18	3	4	24	8.3	.0	.0
Omaha	1,105	170	200	28.82	30.00	+.08	56.4	−6.0	79	27	64	38	5	48	32	50	46	73	3.57	−.2	18	8,127	n.	31	se.	18	4	4	23	8.1	.0	.0
Valentine	2,598	47	54	27.30	30.03	+.13	50.2	−6.0	74	10	59	30	3	42	34	46	42	77	4.36	+1.5	17	7,952	e.	39	se.	31	3	7	21	8.0	T	.0
Sioux City	1,138	64	106	28.79	30.01	+.09	55.0	−5.4	76	27	63	36	3	47	33	49	44	72	2.75	−1.3	19	6,681	e.	32	sw.	7	2	3	26	8.6	.0	.0
Huron	1,306	60	74	28.64	30.05	+.13	53.6	−2.8	74	11	62	32	3	45	29	46	40	65	1.46	−1.5	11	7,736	se.	31	e.	1	5	13	13	6.3	.0	.0
Northern Slope							48.8	−3.9										65	3.33	+1.0										7.1		
Billings	3,570	17	31	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Havre	2,505	11	67	27.36	29.99	+.09	51.6	−1.8	78	16	64	29	2	40	41	43	34	60	1.46	−.6	10	6,813	e.	27	sw.	10	9	12	10	5.7	.4	.0
Helena	4,124	85	111	25.78	29.96	+.03	49.2	−2.4	76	21	60	25	7	38	35	40	30	52	.66	−1.6	10	6,782	sw.	35	s.	16	5	11	15	6.7	1.9	.0
Kalispell	2,973	48	56	.....	29.96	+.08	50.9	−.5	79	30	64	28	8	38	37	.....	.....	57	1.04	−.4	9	5,174	w.	22	sw.	10	9	17	5	.....	T	.0
Miles City	2,371	48	55	27.49	30.03	+.12	52.9	−3.8	78	16	63	31	9	43	35	44	36	59	.96	−1.3	10	6,310	se.	27	w.	7	8	12	11	6.0	T	.0
Rapid City	3,259	50	58	26.62	30.06	+.16	48.5	−5.5	77	10	57	27	4	40	38	43	37	70	6.69	+3.1	17	6,537	n.	30	nw.	1	3	9	19	7.6	T	.0
Cheyenne	6,094	50	71	23.97	29.95	+.10	44.6	−5.7	74	26	54	26	3	36	32	39	36	80	5.89	+3.5	24	7,967	se.	30	nw.	6	1	9	21	8.3	1.2	.0
Lander	5,372	60	68	24.61	29.98	+.08	46.3	−4.9	71	25	56	26	9	37	37	40	34	66	5.92	+3.7	16	4,376	sw.	37	sw.	23	2	10	19	7.8	1.4	.0
Sheridan	3,790	10	47	26.08	29.98	.....	48.2	.....	74	16	59	25	9	38	43	42	35	66	3.12	+.5	16	5,599	se.	30	nw.	10	6	12	13	6.6	.0	.0
Yellowstone Park	6,241	11	48	.....	29.96	+.05	43.4	−4.0	67	21	54	22	4	33	36	.....	.....	64	1.31	−.9	15	6,132	sw.	30	sw.	16	4	12	15	.....	.2	.0
North Platte	2,821	11	51	27.05	29.98	+.10	52.2	−6.5	75	10	60	33	3	45	36	47	43	76	6.24	+3.5	17	6,929	se.	27	se.	10	2	6	23	8.3	T	.0
Middle Slope							57.6	−4.9										73	5.61	+2.2										7.5		
Denver	5,292	106	113	24.68	29.93	+0.09	50.2	−6.0	76	10	59	30	3	42	29	43	38	72	4.95	+2.7	27	6,438	n.	29	nw.	7	0	10	21	8.2	0.7	0.0
Pueblo	4,685	80	86	25.21	29.87	+.04	55.4	−3.8	84	26	65	32	4	46	37	45	37	59	1.60	.0	16	6,051	e.	28	e.	30	7	10	14	6.5	T	.0
Concordia	1,392	50	58	28.50	29.98	+.07	57.6	−5.6	83	11	66	37	5	50	36	52	48	77	6.20	+2.0	17	6,844	ne.	28	se.	11	4	6	21	7.8	.0	.0
Dodge City	2,509	10	86	27.35	29.94	+.07	57.4	−6.1	95	11	66	35	4	49	34	51	46	73	4.40	+1.5	17	9,843	n.	50	s.	31	6	10	15	6.8	.0	.0
Wichita	1,358	85	93	28.49	29.92	+.02	60.7	−4.4	85	1	68	40	5	53	27	56	52	77	11.22	+6.8	20	8,118	ne.	30	nw.	27	2	8	21	7.9	.0	.0
Oklahoma City	1,214	10	47	28.63	29.90	+.01	64.2	−3.5	87	28	72	40	5	56	25	59	57	82	5.29	+.4	20	7,915	s.	32	s.	11	1	11	19	7.8	.0	.0
Southern Slope							67.5	−3.2										61	4.06	+1.4										5.3		
Abilene	1,738	10	52	28.08	29.86	−.01	69.9	−2.1	94	29	80	42	5	60	34	60	54	65	6.40	+2.4	9	8,231	s.	35	sw.	17	12	10	9	5.2	.0	.0
Amarillo	3,676	10	49	26.18	29.87	+.03	60.9	−3.2	93	11	72	31	4	50	35	51	44	63	2.57	−.2	12	7,957	se.	27	se.	30	7	9	15	6.4	2.2	.0
Big Spring	2,537	5	62	27.27	29.85	.....	68.4	.....	93	29	80	40	6	57	40	57	49	60	3.98	.....	10	.....	s.	.....	.....	.....	12	9	10	5.2	.0	.0
Del Rio	944	64	71	28.82	29.78	−.07	75.3	−1.7	94	12	85	50	5	66	30	65	60	66	4.89	+2.0	13	8,583	se.	34	se.	27	8	12	11	5.8	.0	.0
Roswell	3,566	75	85	26.27	29.83	+.01	63.8	−5.6	91	11	76	32	3	52	44	51	40	50	2.38	+1.3	7	6,609	s.	34	sw.	26	16	9	6	3.8	.2	.0
Southern Plateau							63.2	−2.2										42	0.66	+0.2										3.7		
El Paso	3,778	152	175	26.08	29.79	+.01	68.4	−3.1	91	25	80	36	4	56	30	50	32	33	.17	−.2	5	8,787	w.	43	nw.	1	21	7	3	3.0	T	.0
Albuquerque	4,972	5	39	24.96	29.78	.....	58.0	.....	84	30	71	30	2	45	40	45	34	51	.91	+.3	9	7,397	w.	45	e.	3	10	9	12	5.7	2.0	.0
Sante Fe	7,013	38	53	23.19	29.81	.00	50.9	−4.8	74	30	61	28	4	41	28	41	31	53	2.72	+1.5	12	5,101	sw.	22	nw.	16	8	10	13	6.0	4.9	.0
Flagstaff	6,907	10	59	23.26	29.78	.00	47.2	−3.5	72	23	61	25	1	33	37	37	.....	55	.72	.....	5	7,217	sw.	30	s.	30	5	15	11	.....	T	.0
Phoenix	1,108	10	107	28.64	29.78	.00	74.1	−.9	100	23	88	48	4	60	35	53	33	28	.14	.0	3	4,901	e.	28	sw.	17	20	7	4	2.9	.0	.0
Yuma	141	9	54	29.64	29.78	−.01	74.6	−1.6	101	23	90	53	1	59	42	56	40	35	T	.0	0	5,450	w.	27	w.	30	29	1	1	1.1	.0	.0
Independence	3,957	5	26	25.87	29.85	+.01	63.7	+.7	88	26	79	40	1	48	39	46	.....	.....	.00	−.2	0	.....	nw.	.....	.....	.....	22	5	4	.....	.0	.0
Middle Plateau							55.3	−0.6										47	1.65	+0.6										5.7		
Reno	4,527	61	76	25.42	29.90	−.01	55.6	+2.0	81	25	69	33	1	42	40	43	31	46	.28	−.4	4	5,650	w.	31	w.	29	13	13	5	4.2	.0	.0
Tonopah	6,090	12	20	.....	.....	.....	53.8	.....	78	22	65	24	2	43	30	40	26	39	.05	.....	2	.....	nw.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Winnemucca	4,344	18	58	25.56	29.92	+.01	53.8	−.1	84	22	70	27	18	38	45	42	29	48	1.49	+.6	5	5,384	ne.	26	nw.	26	13	7	11	4.6	T	.0
Modena	5,473	10	46	24.51	29.80	−.02	52.6	−.9	79	22	66	29	5	39	44	41	31	53	2.02	+1.2	12	7,833	sw.	34	w.	6	4	12	15	6.5	T	.0
Salt Lake City	4,357	86	210	25.53	29.86	.00	55.4	−2.0	81	26	65	34	1	46	30	45	35	50	3.68	+1.8	11	6,070	nw.	38	s.	16	7	11	13	6.2	.0	.0
Grand Junction	4,602	60	68	25.25	29.79	−.04	59.2	−1.9	83	26	70	34	1	48	35	46	33	46	.77	.0	7	5,460	se.	32	nw.	27	4	10	17	6.9	.0	.0
Northern Plateau							56.0	0.0										46	0.64	−0.7										4.7		
Baker	3,471	48	53	26.43	30.01	+.05	50.4	−1.3	80	21	64	27	11	37	39	41	31	52	.63	−.9	7	5,102	n.	20	nw.	30	14	10	7	4.4	T	.0
Boise	2,739	79	87	27.10	29.95	+.01	56.6	−.5	86	22	70	31	2	43	36	45	33	48	1.04	−.4	5	4,952	nw.	21	se.	30	12	11	8	4.7	.0	.0
Pocatello	4,477	60	68	25.39	29.88	−.01	52.6	−1.2	78	22	63	30	4	42	33	42	31	49	1.69	+.2	11	6,348	se.	34	s.	16	7	11	13	6.2	T	.0
Spokane	1,929	101	110	27.94	29.98	+.02	55.8	+.3	81	30	69	34	3	43	37	44	31	47	.06	−1.4	2	4,909	s.	21	nw.	1	13	10	8	4.7	T	.0
Walla Walla	991	57	65	28.92	29.98	+.02	60.2	+.6	86	21	72	40	3	48	35	47	32	40	.33	−1.3	5	4,396	s.	20	w.	9	14	13	4	4.0	.0	.0
Yakima	1,076	58	67	28.86	30.00	.....	60.5	+1.5	85	21	74	37	10	48	37	47	33	40	.09	−.5	2	5,937	nw.	26	nw.	30	13	13	5	4.4	.0	.0
North Pacific Coast Region							54.4	+0.8										68	0.54	−1.8										5.2		
North Head	211	11	56	29.91	30.14	+.11	50.4	−.5	60	19	53	45	13	47	13	47	45	83	1.06	−1.9	8	11,472	n.	45	s.	16	3	16	12	6.5	.0	.0
Seattle	125	90	321	29.96	30.08	+.07	56.6	+2.1	79	20	66	42	10	47	31	49	41	62	.55	−1.3	8	5,694	n.	26	s.	17	12	13	6	4.5	.0	.0
Tatoosh Island	86	10	54	30.03	30.13	+.12	50.2	+.6	62	25	54	43	24	47	16	47	44	85	.84	−3.2	7	6,268	w.	36	w.	9	5	10	16	6.7	.0	.0
Medford	1,329	29	58	28.62	30.02	.....	57.8	.....	87	21	74	33	12	42	45	47	37	56	.07	−1.1	4	4,807	nw.	21	w.	14	13	12	6	4.2	.0	.0
Portland, Oreg	153	68	106	29.93	30.09	+.06	57.8	+.9	83	20	69	41	2	47	32	50	41	60	.61	−1.6	6	4,637	nw.	17	nw.	9	8	11	12	5.7	.0	.0
Roseburg	510	45	76	29.53	30.08	+.05	57.1	+1.1	83	20	72	36	10	43	42	48	39	60	.11	−1.8	4	3,946	n.	18	n.	23	18	4	9	3.4	.0	.0

[1] Observations taken at airport.

TABLE 1.—*Climatological data for Weather Bureau stations, May 1935*—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷ 2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01, or more	Wind: Total movement	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
Middle Pacific coast region	*Ft.*	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F. 58.0	°F. +0.6	°F.		°F.	°F.		°F.	°F.	°F.	°F.	% 64	*In.* 0.11	*In.* −1.0		*Miles*								*0–10* 4.1	*In.*	*In.*
Eureka	62	73	89	30.01	30.08	+.03	51.4	−.6	71	4	56	41	23	47	24	48	46	85	.30	−1.5	2	5,941	n.	26	n.	30	14	7	10	5.0	.0	.0
Redding	722	20	34				67.8		95	21	80	44	2	56	32	53	40	44	.66		3	6,034	nw.	23	se.	1	18	6	7	3.6	.0	.0
Sacramento	66	92	115	29.84	29.91	−.03	63.9	+.6	96	21	77	46	10	51	36	54	46	60	.01	−.8	1	6,317	s.	23	nw.	3	18	13	0	2.9	.0	.0
San Francisco	155	208	243	29.79	29.96	−.03	58.7	+1.9	85	20	65	49	23	52	30	51	46	69	.01	−.8	1	6,209	sw.	30	nw.	29	13	10	8	4.9	.0	.0
South Pacific coast region							63.7	+0.3										64	0.62	−0.4									4.4		
Fresno	327	97	105	29.54	29.90	−.02	67.5	+.4	98	22	82	47	10	53	36	54	43	48	T	−.4	0	5,214	nw.	20	nw.	29	16	13	2	3.3	.0	.0
Los Angeles	338	159	191	29.58	29.95	.00	62.0	−.2	86	4	69	50	1	55	29	55	50	71	.03	−.4	1	4,243	sw.	15	sw.	3	12	9	10	5.0	.0	.0
San Diego	87	62	70	29.86	29.94	−.01	61.6	+.8	77	5	66	52	3	57	22	56	52	73	.02	−.3	1	5,298	w.	18	sw.	30	11	11	9	5.0	.0	.0
West Indies																																
San Juan, P. R.	82	9	54	29.91	29.99	.....	77.8	−.8	87	30	82	69	29	73	15	....	....	....	5.08	−.2	15	8,964	e.	28	sw.	16	5	14	12	6.5	.0	.0
Panama Canal																																
Balboa Heights	118	6	97	.....	[2] 29.83	+.01	80.6	−.1	91	1	87	72	11	74	17	....	....	[3] 86	8.10	+2.0	20	3,481	nw.	18	s.	22	1	18	12	6.9	.0	.0
Cristobal	36	6	97	.....	[2] 29.84	+.01	81.6	+.9	89	29	86	74	3	77	14	76	75	[3] 82	17.16	+4.6	23	5,196	n.	22	n.	3	1	12	18	7.6	.0	.0
Alaska																																
Fairbanks	454	11	87	[2] 29.38	[2] 29.90	.....	42.4	.....	71	28	52	17	10	32	30	36	26	56	.88	+.3	10	5,656	ne.	21	sw.	7	4	14	13	6.4	1.0	.0
Juneau	80	96	116	[2] 29.95	[2] 30.04	.....	45.4	.....	66	25	51	33	1	40	28	41	37	74	7.62	.....	23	5,205	s.	30	se.	20	2	3	26	8.8	T	.0
Hawaiian Islands																																
Honolulu	38	86	100	[2] 30.02	[2] 30.06	.....	75.8	+1.0	83	19	80	67	9	71	14	68	64	69	.22	−1.5	6	6,995	e.	23	e.	28	8	21	2	4.6	.0	.0

[2] Observations taken bihourly.

[3] Pressure not reduced to mean of 24 hours.

TABLE 2.—*Data furnished by the Canadian Meteorological Service, May 1935*

Stations	Altitude above mean sea level, Jan. 1, 1919	Pressure: Station reduced to mean of 24 hours	Pressure: Sea level reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷2	Temperature of the air: Departure from normal	Temperature of the air: Mean maximum	Temperature of the air: Mean minimum	Temperature of the air: Highest	Temperature of the air: Lowest	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Total snowfall
	Feet	*In.*	*In.*	*In.*	°F.	°F.	°F.	°F.	°F.	°F.	*In.*	*In.*	*In.*
Cape Race, Newfoundland	99												
Sydney, Cape Breton Island	48	29.75	29.80	−0.17	44.3	−0.9	53.8	34.7	64	28	2.38	−1.39	0.0
Halifax, Nova Scotia	88				48.3	−.1	56.1	40.6	70	34	2.71	−1.55	.0
Yarmouth, Nova Scotia	65	29.78	29.85	−.13	47.2	−.4	54.0	40.4	67	32	2.10	−1.47	.0
Charlottetown, Prince Edward Island	38	29.74	29.78	−.18	46.6	−.3	55.2	38.1	68	29	1.29	−1.62	.0
Chatham, New Brunswick	28	29.71	29.74	−.21	47.6	−.9	58.7	36.6	77	28	2.12	−1.09	.0
Father Point, Quebec	20	29.80	29.82	−.11	44.8	+.8	52.0	37.6	64	28	.89	−1.78	1.8
Quebec, Quebec	296	29.65	29.97	+.03	49.6	−.3	58.1	41.0	79	26	1.73	−1.35	.3
Doucet, Quebec	1,236				40.4		52.3	28.4	79	12	1.48		4.4
Montreal, Quebec	187												
Ottawa, Ontario	236	29.71	29.97	+.03	50.3	−4.6	61.6	39.1	80	29	1.29	−1.30	.0
Kingston, Ontario	285	29.68	29.99	+.03	49.2	−3.7	57.2	41.3	68	30	2.51	−.17	.0
Toronto, Ontario	379	29.62	30.03	+.05	52.0	−1.2	61.1	42.8	79	32	1.70	−1.34	T
Cochrane, Ontario	930				43.4		54.0	32.9	81	16	1.32		4.3
White River, Ontario	1,244	28.77	30.10	+.15	43.5	−2.2	57.5	29.5	80	10	1.05	−.90	.0
London, Ontario	808				48.6		59.0	38.2	77	28	3.32		T
Southampton, Ontario	656	29.34	30.06	+.10	44.7	−6.0	53.3	36.2	72	26	1.18	−1.26	3.5
Parry Sound, Ontario	688	29.34	30.04	+.09	48.6	−2.5	58.8	38.4	76	27	1.63	−1.30	4.8
Port Arthur, Ontario	644	29.38	30.10	+.14	47.2	+1.3	56.1	38.3	80	28	1.31	−.84	.0
Winnipeg, Manitoba	760	29.25	30.09	+.13	50.7	−.9	61.6	39.9	79	30	1.72	−.56	.0
Minnedosa, Manitoba	1,690	28.26	30.08	+.12	48.4	.0	59.8	36.9	74	25	.93	−.52	1.8
Le Pas, Manitoba	860		30.11		51.2		62.8	39.6	81	26	2.02		.0
Qu'Appelle, Saskatchewan	2,115	27.75	30.00	+.06	47.4	−2.4	57.4	37.4	75	25	3.05	+1.40	T
Moose Jaw, Saskatchewan	1,759				47.9		57.3	38.5	77	26	4.67		1.0
Swift Current, Saskatchewan	2,392	27.44	29.97	+.05	48.6	−2.1	58.0	39.1	74	25	1.14	−.62	.0
Medicine Hat, Alberta	2,365	27.43	29.91	+.02	50.7	−3.4	60.5	41.0	78	29	2.52	+1.21	3.2
Calgary, Alberta	3,540	26.27	29.94	+.06	46.5	−2.5	57.7	35.2	74	25	3.02	+1.25	9.2
Banff, Alberta	4,521												
Prince Albert, Saskatchewan	1,450	28.50	30.09	+.14	48.6	+1.0	58.3	39.0	76	26	1.03	−.23	.0
Battleford, Saskatchewan	1,592	28.27	30.01	+.09	49.8	−1.2	61.7	37.9	80	26	.45	−1.17	.0
Edmonton, Alberta	2,150	27.68	29.95	+.07	50.0	−.8	60.0	40.1	79	25	2.95	+1.40	2.8
Kamloops, British Columbia	1,262												
Victoria, British Columbia	230												
Barkerville, British Columbia	4,180												
Estevan Point, British Columbia	20				49.0		55.1	43.0	62	37	1.51		.0
Prince Rupert, British Columbia	170				46.8		53.4	40.3	64	34	1.78		.0
Hamilton, Bermuda	151	29.90	30.06	.00	70.5	+1.1	75.4	65.6	80	60	6.70	+2.04	.0

TABLE 2.—*Data furnished by the Canadian Meteorological Service, May 1935*—Continued

LATE REPORTS FOR APRIL 1935

Stations	Altitude above mean sea level, Jan. 1, 1919	Pressure			Temperature of the air						Precipitation		
		Station reduced to mean of 24 hours	Sea level reduced to mean of 24 hours	Departure from normal	Mean max. + mean min. ÷2	Departure from normal	Mean maximum	Mean minimum	Highest	Lowest	Total	Departure from normal	Total snowfall
	Feet	*In.*	*In.*	*In.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	*In.*	*In.*	*In.*
Cape Race, Newfoundland	99				31.7		36.7	26.8	51	18	3.85		19.0
Sydney, Cape Breton Island	48	29.77	29.82	−0.07	34.8	−0.2	42.8	26.8	58	11	3.50	−0.35	1.0
Halifax, Nova Scotia	88	29.60	29.71	−.25	38.0	+.2	44.3	31.8	58	21	4.56	+.38	.6
Yarmouth, Nova Scotia	65	29.73	29.80	−.16	39.9	+1.0	46.4	33.4	55	24	2.68	−1.14	1.5
Charlottetown, Prince Edward Island	38	29.76	29.80	−.10	34.7	−.5	41.5	27.8	53	17	2.87	+.22	.5
Chatham, New Brunswock	28	29.75	29.78	−.12	34.9	−.6	43.7	26.1	65	13	3.35	+.72	1.6
Father Point, Quebec	20	29.87	29.89	−.04	33.9	+.7	39.9	28.0	51	12	1.54	−.04	4.6
Ottawa, Ontario	236	29.67	29.94	−.08	42.4	+2.4	51.2	33.6	81	19	1.98	+.48	3.5
White River, Ontario	1,244	28.74	30.09	+.05	29.7	−3.3	44.0	15.5	67	−6	3.10	+1.85	18.1
Qu'Appelle, Saskatchewan	2,115	27.69	29.98	−.01	34.6	−2.8	44.8	24.5	71	−3	1.10	+.05	7.9
Edmonton, Alberta	2,150	27.60	30.03	+.14	30.7	−9.2	40.4	21.1	65	−6	1.95	+1.07	17.3
Kamloops, British Columbia	1,262	28.71	30.01	+.08	46.3	−2.6	58.8	33.8	76	18	.02	−.37	.0
Victoria, British Columbia	230												
Barkerville, British Columbia	4,180												
Estevan Point, British Columbia	20				44.7		52.4	37.0	65	28	5.78		.0
Prince Rupert, British Columbia	170				40.9		48.1	33.7	57	26	.93		.0
Hamilton, Bermuda	151												

SEVERE LOCAL STORMS, MAY 1935

[Compiled by Mary O. Souder; authorities, U. S. Weather Bureau officials]

[The table herewith contains such data as have been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the Annual Report of the Chief of Bureau]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Hennepin and Ramsey Counties, Minn., and vicinity.	1–2				$250,000	Snow, sleet, glaze, and wind.	Considerable damage to wires, poles, and trees; highways obstructed; trains off schedule; greatest damage occurred to the north and east of the Twin Cities; at Minneapolis the snowfall of 3 inches was the heaviest recorded in May since 1892.
Joplin, Mo.	2	3 a. m.	880	0		Tornado	Property damaged; path 3 miles long.
Eastern Sullivan and western Greene Counties, Ind.	2	3:30–4 a. m.	67	0	52,000	do	Damage greatest in Jasonville where 17 persons were injured, some seriously; path 4 miles long.
Graysville, Ind.	2	4 a. m.	440	0	60,000	do	Property damaged; path 30 miles long.
Dermott, Ark.	2	5:45 p. m.		1	2,000	do	3 houses demolished and several damaged; path narrow.
Mississippi County, Ark.	2	6:30 – 7:30 p. m.		3	100,000	do	23 persons injured; path 35 miles long.
Golddust, Tenn., and vicinity	2	7 p. m.	[1] 20	0	12,000	do	Property damaged over a path 20 miles long.
Clarendon, Ark., and vicinity	2				1,000	Wind	2 smokestacks blown down; several houses unroofed and others damaged.
Harrisburg, Ark., and vicinity	2				3,300	do	Houses and barns unroofed; property damaged.
Melbourne, Ark., and vicinity	2				500	Electrical and wind.	2 houses damaged and 2 barns demolished; 5 persons injured when lightning struck a house.
Union County, Ark., southeastern portion.	2			1	12,000	Wind	Property damaged; path 15 miles long.
Harrisburg, Ill.	2				1,000	do	No details.
Orange County, N. Y.	2				200,000	Dust and wind	High wind caused a severe dust storm over muck lands resulting in severe damage to onion plantings.
Memphis, Tenn.	2					Wind	Several hundred dollars damage to telephone and power lines.
Albuquerque, N. Mex.	3	10 a. m.–4 p. m.				do	2 persons injured; electric signs blown down; houses unroofed; windows broken.
Richmond (near), Va.	3	5–7 p. m.	440		1,000	Thunderstorm	A dozen large trees blown down; a small barn wrecked.
Avinger–Linden, Tex.	3	11 p. m.			55,000	Hail and wind	$50,000 amount of damage to crops; $5,000 to buildings; 3 persons injured; path 2½ miles long.
Milwaukee, Wis.	3					Snow	Heaviest May snowfall of record; partly melted as it fell, but amounted to 3.2 inches; strong northeast to north winds and temperature about freezing; in some outlying sections of the city snow measured 5 to 6 inches in depth causing much inconvenience to traffic.
Michigan	3–4					Heavy snowfall	Several stations recorded falls of as much as 6 inches in the northeastern quarter of lower Michigan extending over a rather narrow belt westward to Ludington and Hart on Lake Michigan.
Shreveport, La.	4–5					Excessive rain	Damage extensive in this area; much farm land and portions of the city flooded; water several inches deep in some of the residential sections of the city.
Simpson County, Miss.	6	8 a. m.	100	0		Tornado	Path 3 miles long.
Spartanburg, S. C., 5 miles west.	6	7:30 p. m.			4,500	Thunderstorm	Southern Railway shops damaged; a church blown from its foundation.
Paeonian Springs (near), Va.	7	9:30 a. m.	880		3,000	Wind	Property damaged.
Jefferson, Okla., vicinity of	8	7:30 p. m.	400	0	28,000	Tornado	3 persons injured; several houses and barns demolished; power and telephone lines down; loss to crops; path 3 miles long.
Hutchinson, Kans., and vicinity.	8	8 p. m.	[1] 7		35,000	Heavy hail	Automobile tops riddled; roofs damaged; much glass broken in greenhouses; $10,000 loss to crops, chiefly wheat; path 20 miles long.
Pauline to Wakarusa, Kans.	8	8:30 p. m.	[1] 2		10,000	do	Loss to crops; some hailstones an inch in diameter; path 6 miles long.
Jackson, Atchison, and Jefferson Counties, Kans.	8	8:30–9 p. m.	[1] 8		18,000	do	Worst damage 5 miles northeast of Valley Falls; path 20 miles long.
Beardstown–Virginia, Ill.	8				10,000	Wind	1 person injured.
Beason–Broadwell, Ill.	8				3,000	do	No details.
Cantrall–Williamsville, Ill.	8				5,000	do	Do.
Coatsburg, Ill., and vicinity	8		[1] 4		15,000	Hail	Property damage $5,000; loss to crops $10,000.
Ray, Carroll, and Lafayette Counties, Mo.	8		[1] 2–5		100,000	do	A number of cattle killed; loss to crops; orchards, greenhouses, and automobile tops severely damaged, path 25 to 30 miles long.
Springfield, Ill., and vicinity	8				10,000	Wind	Damage resulted from a 38 mile per hour wind that occurred in connection with a thunderstorm.
Barry, Ill.	8–9					Rain, wind, and hail.	Storm lasted from 7 p. m., of the 8th until 2 a. m., of the 9th; 3 separate periods of hail reported; wires and trees down.
Madison County, Fla.–Brook County, Ga.	9	1 p. m.			500	Heavy hail	Loss to crops; amount estimated for Madison County only; probably $500 to $1,000 damage in Brook County, Ga.
Adams County, Ill.	9	8 p. m.	[1] 2½			Rain and hail	Property damaged; houses flooded; much loss to crops; path 3 miles long.

[1] Miles instead of yards.

SEVERE LOCAL STORMS, MAY 1935—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
San Antonio, Tex.	9	P. m.			60,000	Hail	Damage to roofs and windows.
Mineral Ridge and Tiffin, Ohio, and vicinity.	9					Electrical	House struck by lightning and damaged; 1 person cut by falling glass.
San Antonio, Tex.	9–10			1	188,000	Excessive rain, wind, and hail.	Extreme velocity of 57 miles per hour recorded; damage from hail small; store and basement in business district flooded; streets damaged; man drowned in attempting to leave a stalled car.
Scott City, Kans., 11 miles north.	10	6:30 p. m.	[1] 5		2,000	Heavy hail	Path 20 miles long; no details.
Ferndale, Ark., and vicinity	10					do	Several hundred dollars damage to gardens, crops and roofs of houses.
Luling, Tex.	11	5 a. m.	[1] 2	0	20,000	Tornado	Damage to buildings and oil derricks.
Russell County, Kans.	11	12:15 a. m.	17		4,000	Tornadic winds	Lumberyard; warehouse and oil derricks damaged; path 1 mile long.
Central City, Nebr.	11	5–5:12 p. m.	[1] 1		25,000	Hail	Hailstones flat and 3 inches in diameter; windows, skylights and glass in greenhouses demolished; 300 roofs and many automobiles damaged.
Deshler, Nebr.	11	6:30–6:45 p. m.		0	10,000	Tornado	No details.
Cordova, Nebr.	11	6:45 p. m.	[1] 3	0	30,000	do	1 person injured; 12 farms affected; 2 dwellings, many barns and outbuildings destroyed; stock killed.
Nickerson, Kans., vicinity of.	11	7:20 p. m.	880	0	10,000	do	Farm buildings damaged; 1 person injured; path 2 miles long.
White Cloud, Kans., 8 miles west.	11	10 p. m.	100	0	5,000	do	A farmhouse and several other farm buildings damaged; path 3 miles long.
Nemaha and Brown Counties, Kans.	11	11 p. m.	880		6,800	Wind and hail	Storm heaviest a few miles north of Sabetha where drifts of hail 2 feet deep were reported; $1,000 loss from hail; path 18 miles long.
Preston, Nebr.	11–12	10 p. m.–2 a. m.	[1] 3	0	2,000	Tornado and hail.	No details.
Bird Island and Belleplaine, Minn., vicinity of.	11–12				33,500	Thunderstorm and hail.	Flood and considerable loss from hail.
Tomah and Sparta, Wis., vicinity of.	11–12				35,000	Heavy rain	In Sparta, Beaver Creek rose so high that water was 2 feet deep in Main Street; property damage $25,000; loss to crops, $10,000; considerable damage in the west-central counties due to overflow of small streams and washouts.
Chicago, Ill.	12	3:05–5:50 a. m.				Electrical and rain	Excessive rain caused flooding; traffic hampered in many parts of the city; some damage from lightning.
Waterloo, near, Ill.	12					Electrical	Barn and contents, including livestock, burned; loss several thousand dollars.
Chicago, Ill.	13				1,000,000	Excessive rain and flood.	3.36 inches of rain recorded in less than 36 hours; heaviest May rainfall in 62 years; street-car service on the entire northwest side crippled because flooded viaducts; the Chicago surface lines called out extra crews to man the pumps; thousands of basements flooded and hundreds of automobiles stalled.
Norton County, Kans., northern portion.	13	4 a. m.	[1] 2		5,000	Heavy hail	Path 9 miles long; no details.
Fort Smith, Ark., 5 miles southeast.	13					Wind	Several buildings demolished and a number of residences damaged.
Campbell Hill and vicinity, Ill.	13				50,000	Hail	Loss to crops $45,000; property damage $5,000; area covered 25 square miles.
Palestine, Ill., and vicinity	13		[1] 1		20,000	do	Property damage $5,000; loss to crops $15,000; path 3 miles long.
Fort Worth, Tex.	14	12:55 p. m.			11,000	Wind	Windows broken; roofs and signs damaged.
Guilford-Rockingham County line to Pitt County, N. C.	14	3:30–4:30 p. m.			300,000	Hail	Loss to crops; some hailstones 2½ inches in diameter.
Ragland, N. Mex.	14	4 p. m.	[1] 2½			Heavy hail	All crops beaten into the ground, some were revived.
Spartanburg, near, S. C.	15	2:30 p. m.			500	Hail	Damage to roofs and windows $200; crop loss $300.
Greenville County, S. C.	15	5 p. m.			1,000	Severe hail	Damage to automobile tops and windows; in some places crops had to be replanted.
Charleston, near, S. C.	16	P. m.	[1] 10		1,500	Hail	Roofs and window panes damaged; $1,000 loss to crops; largest stones about hen-egg size.
Platte and Goshen counties, Wyo., northern portions.	16	do				Rain and hail	Storm covered area of 50 square miles with Sunrise as the center; very heavy hail carried by the flood clogged the waterways and the receding water left deposits of hail from 3 to 5 feet deep which solidified and later freshets carried down streams in great blocks that destroyed all movable property in its path; a branch railroad, an improved highway as well as considerable ranch property in Hartville Canyon greatly damaged.
Burrton, Kans., and vicinity	17	9:15 p. m.	[1] 3		1,500	Heavy hail	Damage to gardens and shrubbery; path 6 miles long; hailstones 3 inches deep in places.
Rainbow, Tex.	18	3 a. m.		0	4,000	Tornado	Buildings and crops damaged; several persons injured.
Fort Worth, Tex.	18	4 a. m.			1,000	Wind	1 person injured; roofs chimneys and frail buildings damaged.
Hearne, Tex.	18	6:30 a. m.	200	0	100,000	Tornado	8 persons injured; some buildings damaged; others destroyed.
Marlin, Tex.	18	7 a. m.	880	0	3,000	do	Damage to farm structures and utility lines; loss to crops.
Oakwood, Tex.	18	8 a. m.	880	0	200	do	1 person injured; house damaged and outbuildings destroyed.
Teague, Tex.	18	do		1	100,000	Wind	About 100 houses blown down or wrecked; buildings demolished; 1 person critically injured.
Weldon, Tex.	18	9:30 a. m.	75	2		Tornado	3 persons injured; $25,000 loss to crops; 5 houses completely destroyed; household goods demolished.
Weches, Tex.	18	12:30 p. m.	50	2	25,000	do	43 persons injured; damage to buildings and household effects.
Little Rock, Ark.	18	4:30 p. m.			30,700	Tornado and thunderstorm.	Several persons injured; hundreds of valuable shade trees uprooted; damage to residences, greenhouses, and telephone and power lines; path 2½ miles long.
Altus, Okla.	18					Rain and flood	7 inches of rain fell; communication lines down; gas system flooded.
Henderson (near), Tex.	18		200	2	2,000	Wind	Damage to houses.
New Braunfels, Tex.	18		50	0		Tornado	Some houses and barns unroofed; other destroyed.
San Antonio, Tex., eastern portion.	18					Hail and wind	Several homes damaged; 2 large radio towers blown down; maximum wind velocity of 47 miles per hour recorded.
Tenaha, Tex.	18		880	0	25,000	Tornado	14 persons injured; 28 houses blown down.
Uvalde, Tex.	19	2:15 a. m.	2,560		20,000	Hail	$20,000 damage to buildings; loss to crops not estimated.
Jewell and Republic Counties, Kans.	19	3 p. m.	20	0	5,000	Tornado, rain, and flood.	3 bridges washed out on roads near Republic and nearly 2 miles of Missouri Pacific track inundated; farmhouse and other buildings damaged; path 22 miles long.
Scandia, Kans., vicinity of	19	do		0	500	Tornado	Farm buildings damaged; path short.
Dodge City, Kans., few miles northwest.	19	4 p. m.		0		do	Cloud dipped to earth only once; no damage reported.
Byron, Nebr.	19	4:30 p. m.	833	0	7,000	Tornado and hail	All buildings on 2 farms destroyed; this storm extended into Kansas.
Hinds County, Miss.	19	11:40 p. m.	100	1	50,000	Tornado	Path 8 miles long.
Simpson County, Miss.	19		100	0	2,000	do	Path short.
Hattiesburg, Miss.	20	4 a. m.				Electrical	Dwelling destroyed by lightning.
Branchville, S. C., and vicinity.	20	2:45 p. m.	880	0	50,000	Tornado and hail	Several persons injured; school almost wrecked; church and hall blown down; 25 houses damaged; trees uprooted; poles and wires down; path 2 miles long; damage from hail $10,000.
Elloree, S. C.	20	4 p. m.				Wind and hail	Loss to young crops and grain.
Fairfax, Okla.	20	P. m.				Tornado and rain	Homes destroyed; oil derricks blown down; communication lines wrecked; house blown 150 feet and 2 occupants injured.
Houma, La., 3 miles northwest.	20		500	0	3,000	Thunderstorm and tornado.	Damage to tenant houses; path several miles long.
Apperson, Okla., and vicinity.	20					Wind and electrical.	On 1 ranch 155 cattle were killed; 55,000-barrel storage tank of the Gypsy Oil Co. struck by lightning and burned.
Charleston, near, S. C.	21			0	100	Tornado	3 small houses damaged.
Chouteau County, Mont.	23			1		Electrical	Farmer killed by lightning.

[1] Miles instead of yards.

SEVERE LOCAL STORMS, MAY 1935—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Crockett and Rural Retreat, Va., and vicinity.	24				5,000	Heavy hail	Loss to crops.
Ravalli County, Mont.	25					Electrical	Some livestock killed by lightning.
Pampa, Tex.	26	4 p. m.	[1] 6		5,500	Hail	$5,000 damage to crops; $500 to roofs and windows.
Groom, Tex.	26	11 p. m.	[1] 3	0	15,000	Tornado	Buildings damaged; 6 persons injured.
Pawnee Creek, Colo.	26			3		Flood	A large volume of water surged down Pawnee Creek drowning 3 persons.
Roxana, Tex.	26				25,000	Wind	11 persons injured; oil-field houses blown down; 22 derricks damaged.
Perry, Kans., 8 miles northwest.	27	8 p. m.	880	0	34,000	Tornado	Small farm buildings destroyed; path 11 miles long.
Fulton County, Kans.	27	8–9 p. m.	[1] 1		5,000	Wind	Path 1 mile long; no details.
Hobart, near, Okla.	27	P. m.	440	0	5,000	Tornado	3 persons injured; several homes demolished; slight crop loss; path 6 miles long.
Abbott, N. Mex.	28	1 p. m.	[1] 6			Heavy hail	Hail 4 to 6 inches deep; damaged grass and gardens.
Bueyeros, N. Mex.	28	2 p. m.	[1] 6			do	Considerable damage to roofs; loss to fruit crop.
Kouts, Ind., vicinity of.	28	3:45 p. m.		0		Tornado	No injury reported; buildings unroofed and trees uprooted.
Marland, near, Okla.	28	3:50 p. m.	25	0	2,725	do	Property damaged; path 3½ miles long.
Amistad, N. Mex.	28	4 p. m.	[1] 6			Heavy hail	Grass cut; roofs damaged and windows broken.
Kingfisher, Okla., 3 miles northwest.	28	5 p. m.	[1] 4		12,000	Hail	$7,000 crop damage; $5,000 to property; path 14 miles long.
Western Steuben County, Ind., through State line into Michigan.	28	5:30 p. m.	[1] 2			Wind	Many barns and garages destroyed; much lake property at Crooked Lake and Lake James damaged by falling trees.
Humboldt–Dawson, Nebr.	29	5–6 p. m.	[1] 2		12,000	Hail and excessive rain.	Hail damaged roofs, glass, and automobiles; basements and yards flooded; crop loss from hail and washing.
Maysville, Okla.	29	7 p. m.	[1] 5		400,000	Hail	Hailstones as much as 3 inches in diameter; automobile tops punctured; many fields of grain and other crops beaten down, some fields being a total loss; length of path, 12 to 15 miles.
Cold Springs, Okla., 3 miles southeast.	29	8:30 p. m.	[1] 1		20,000	Heavy hail	Damage principally to crops; path 5 miles long.
Colorado Springs, Colo., and vicinity.	30			4	1,800,000	Excessive rain and flood.	Property damaged.
Pueblo, Colo., vicinity of.	30				165,150	do	Flood waters along the Fountain River caused much damage.
McCook–Curtis, Nebr.	31	3:30–4:30 p. m.	[1] 3–5	5	150,000	Tornado	22 persons injured; 44 homes wrecked, others damaged.
Olathe, Kans., few miles east.	31			0		do	No details.
Phillipsburg, Kans., 10 miles northeast.	31	4 p. m.	100	0	10,000	do	Farmhouse badly damaged and several small farm buildings demolished; path 5 miles long.
Farnam, Nebr.	31	do	833	0	20,000	do	10 persons injured; other details not given.
Overton, Nebr.	31	5 p. m.	67	0	20,000	do	No details.
Miller, Nebr.	31	7 p. m.	400	2	30,000	do	3 persons injured.
Avon, S. Dak., southward to Missouri River.	31	8–12 p. m.				Rain and wind	A fill on railroad was made unsafe for trains by heavy rain; corn washed out and fields had to be replanted.
Laramie, Platte, and Goshen Counties, Wyo.	31			8	1,250,000	Flood	Much property damage.

[1] Miles instead of yards.

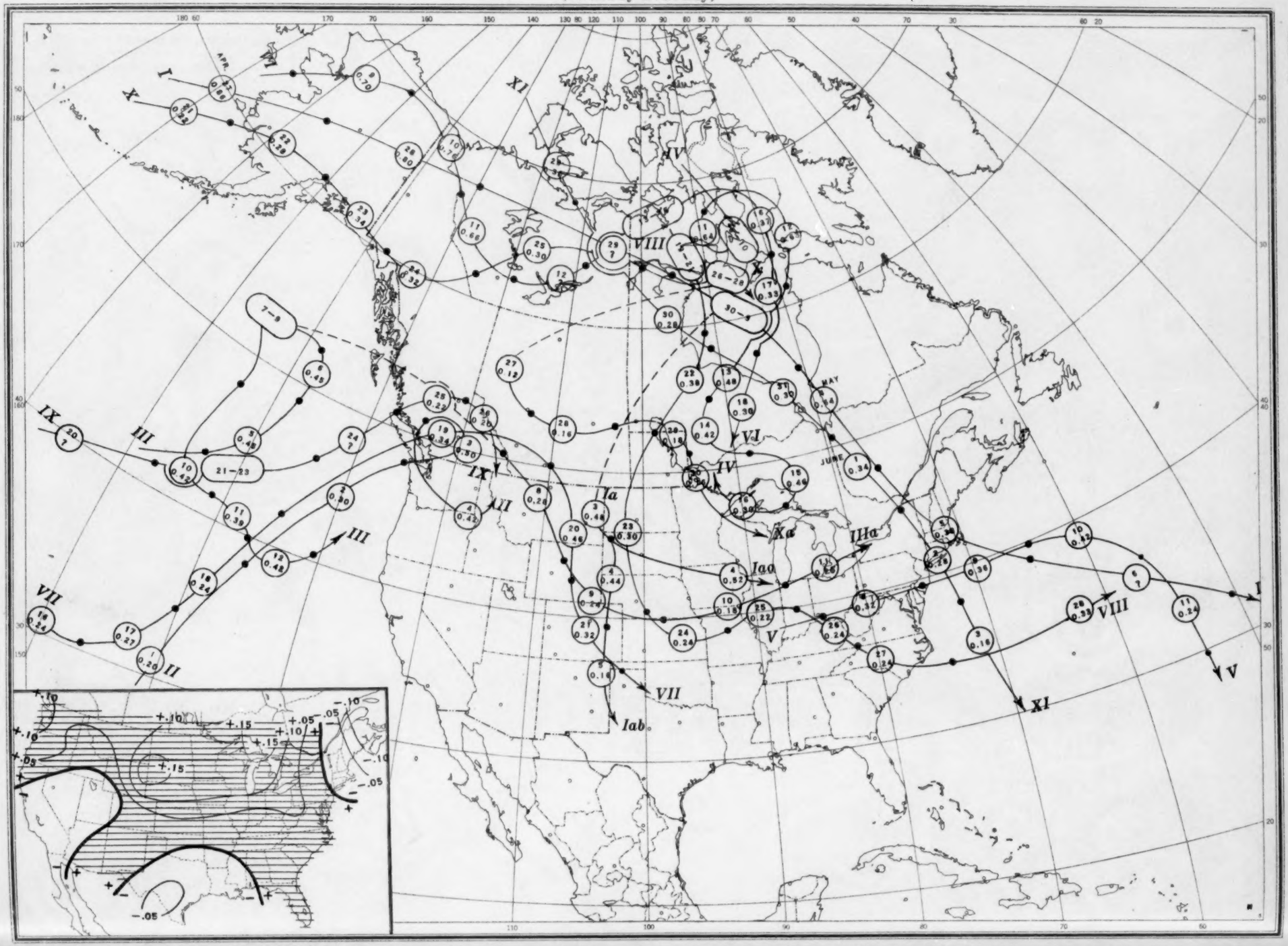
Chart I. Departure (°F.) of the Mean Temperature from the Normal, May 1935

Chart I. Departure (°F.) of the Mean Temperature from the Normal, May 1935

Shaded portions show excess (+)
Unshaded portions show deficiency (−)
Lines show amount of excess or deficiency
Statute Miles
Kilometers

Chart II. Tracks of Centers of Anticyclones, May 1935. (Inset) Departure of Monthly Mean Pressure from Normal

(Plotted by W. P. Day)



Circle indicates position of anticyclone at 8 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 8 p. m. (75th meridian time).

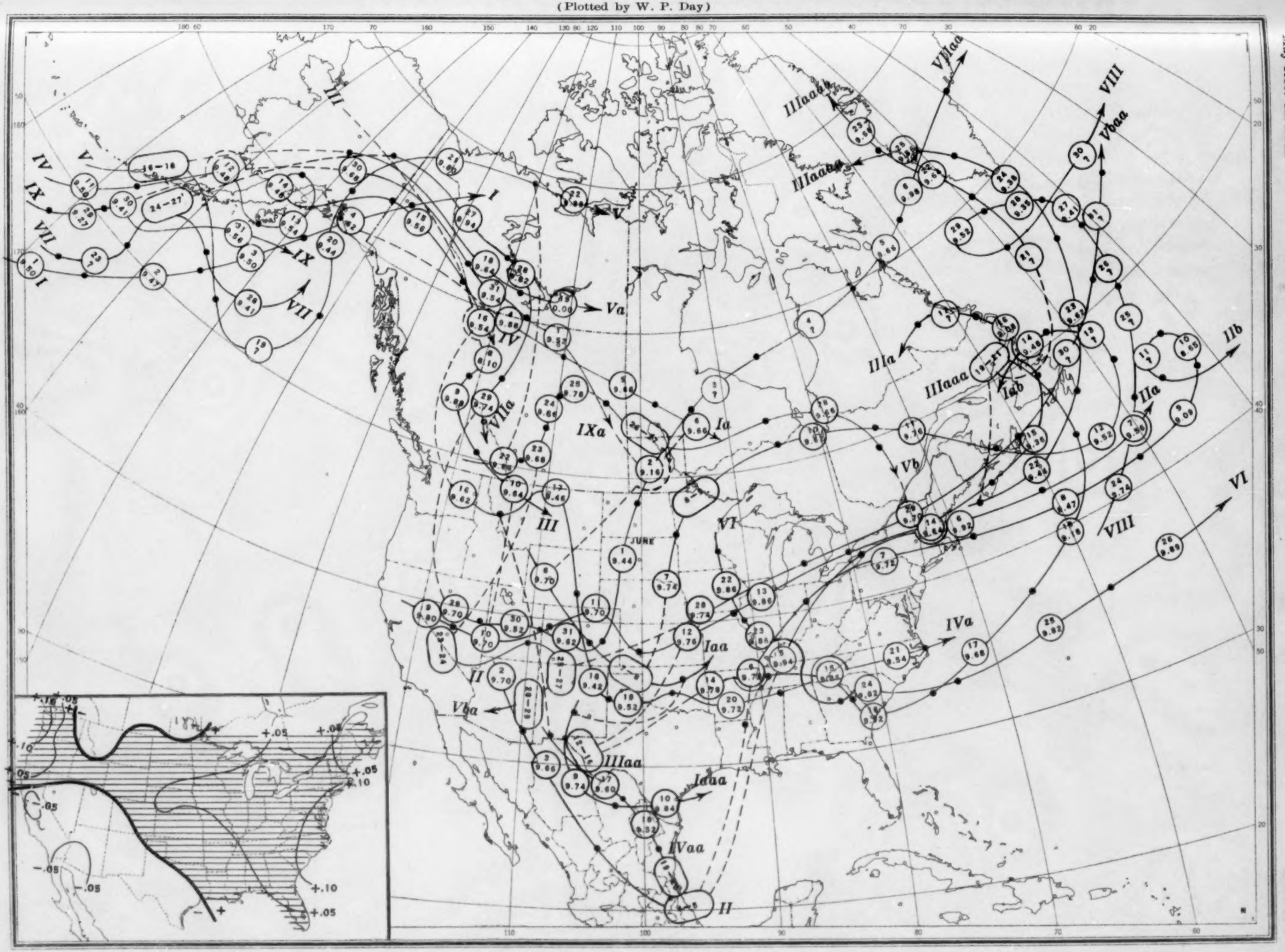
Chart III. Tracks of Centers of Cyclones, May 1935. (Inset) Change in Mean Pressure from Preceding Month

(Plotted by W. P. Day)

Circle indicates position of anticyclone at 8 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 8 p. m. (75th meridian time).

Chart III. Tracks of Centers of Cyclones, May 1935. (Inset) **Change in Mean Pressure from Preceding Month**

(Plotted by W. P. Day)



Circle indicates position of cyclone at 8 a. m. (75th meridian time), with barometric reading. Dot indicates position of cyclone at 8 p. m. (75th meridian time).

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, May 1935

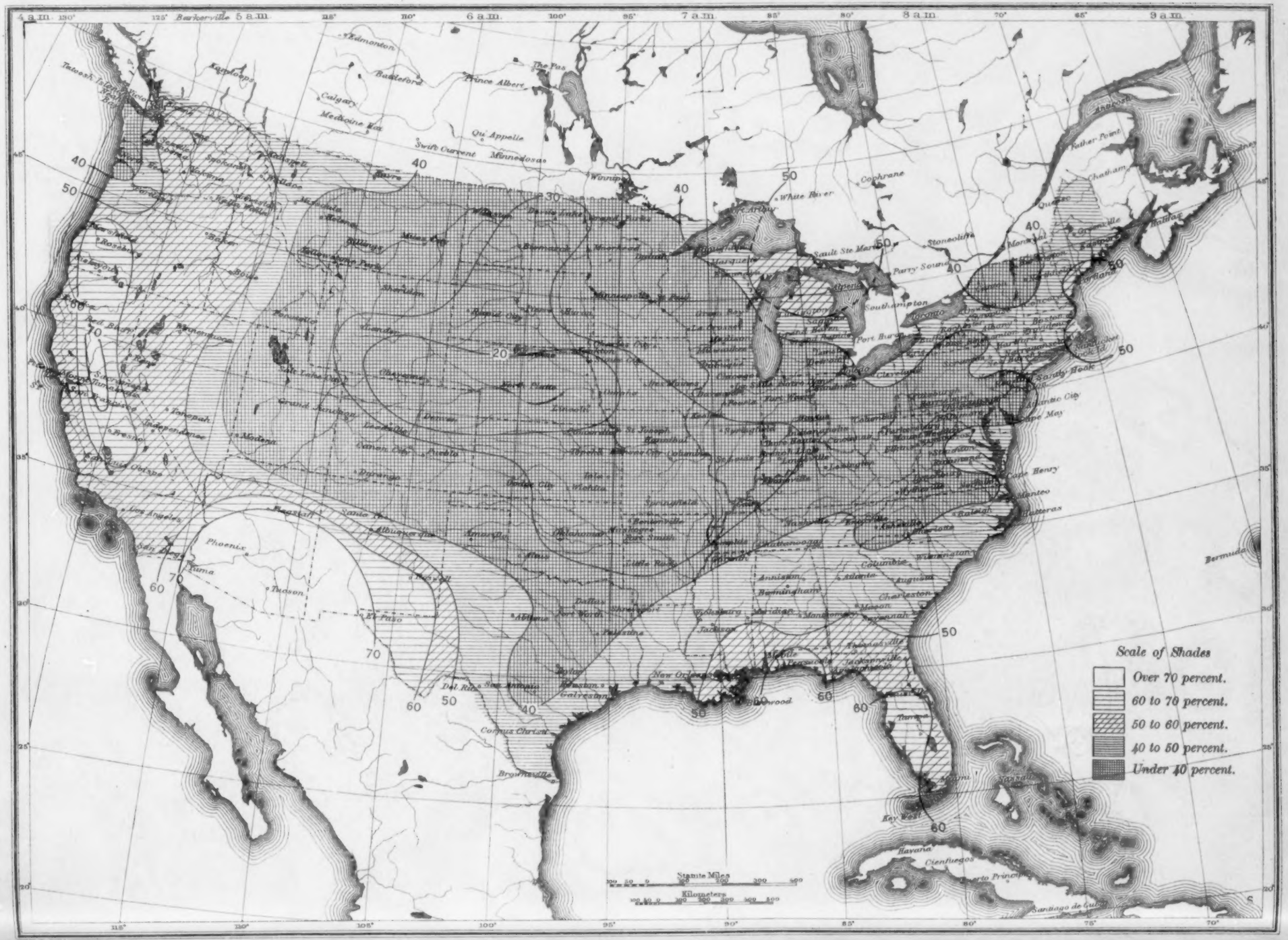


Chart V. Total Precipitation, Inches, May 1935. (Inset) Departure of Precipitation from Normal

Chart V. Total Precipitation, Inches, May 1935. (Inset) Departure of Precipitation from Normal

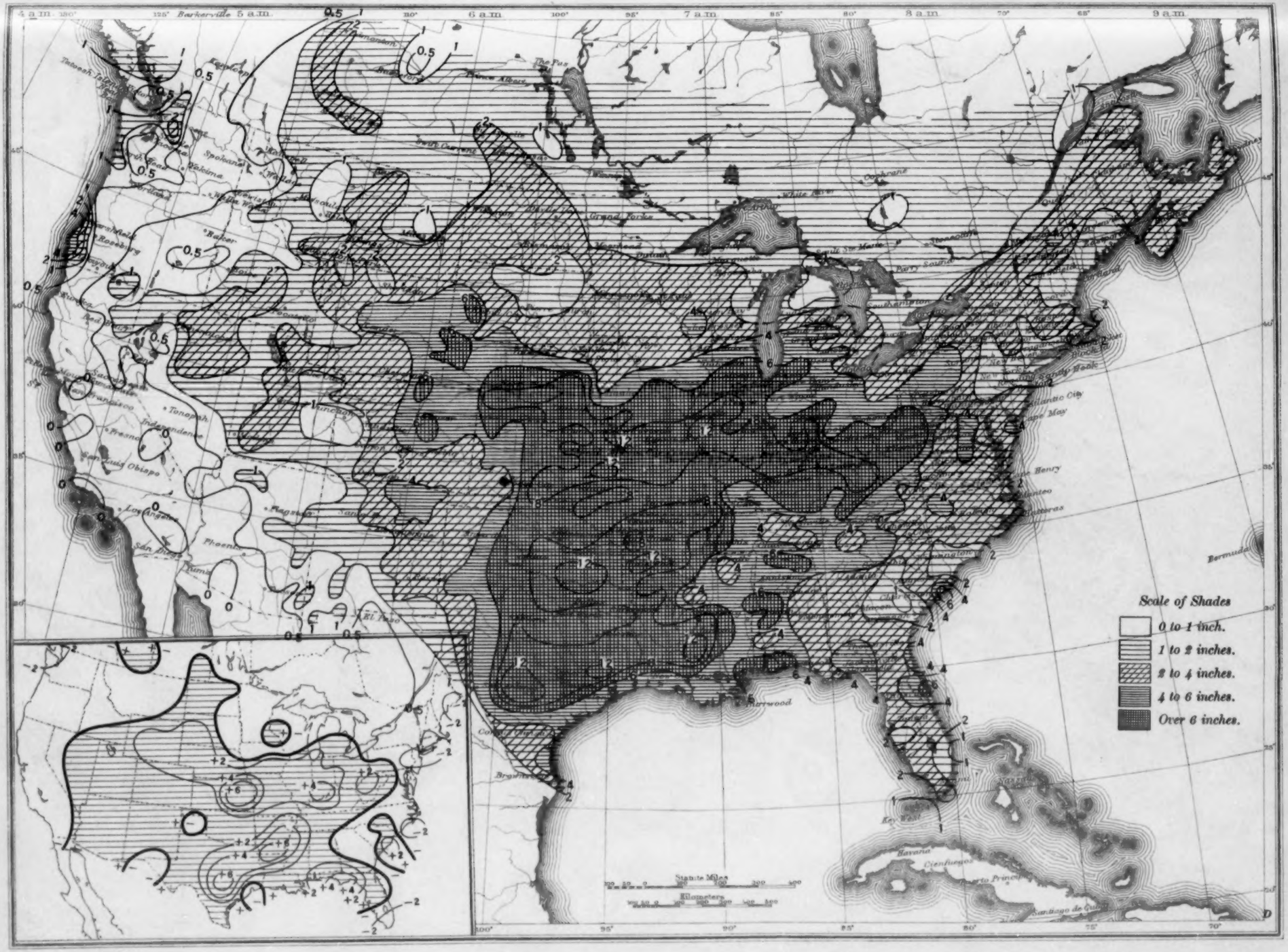


Chart VI. Isobars at Sea Level and Isotherms at Surface; Prevailing Winds, May 1935

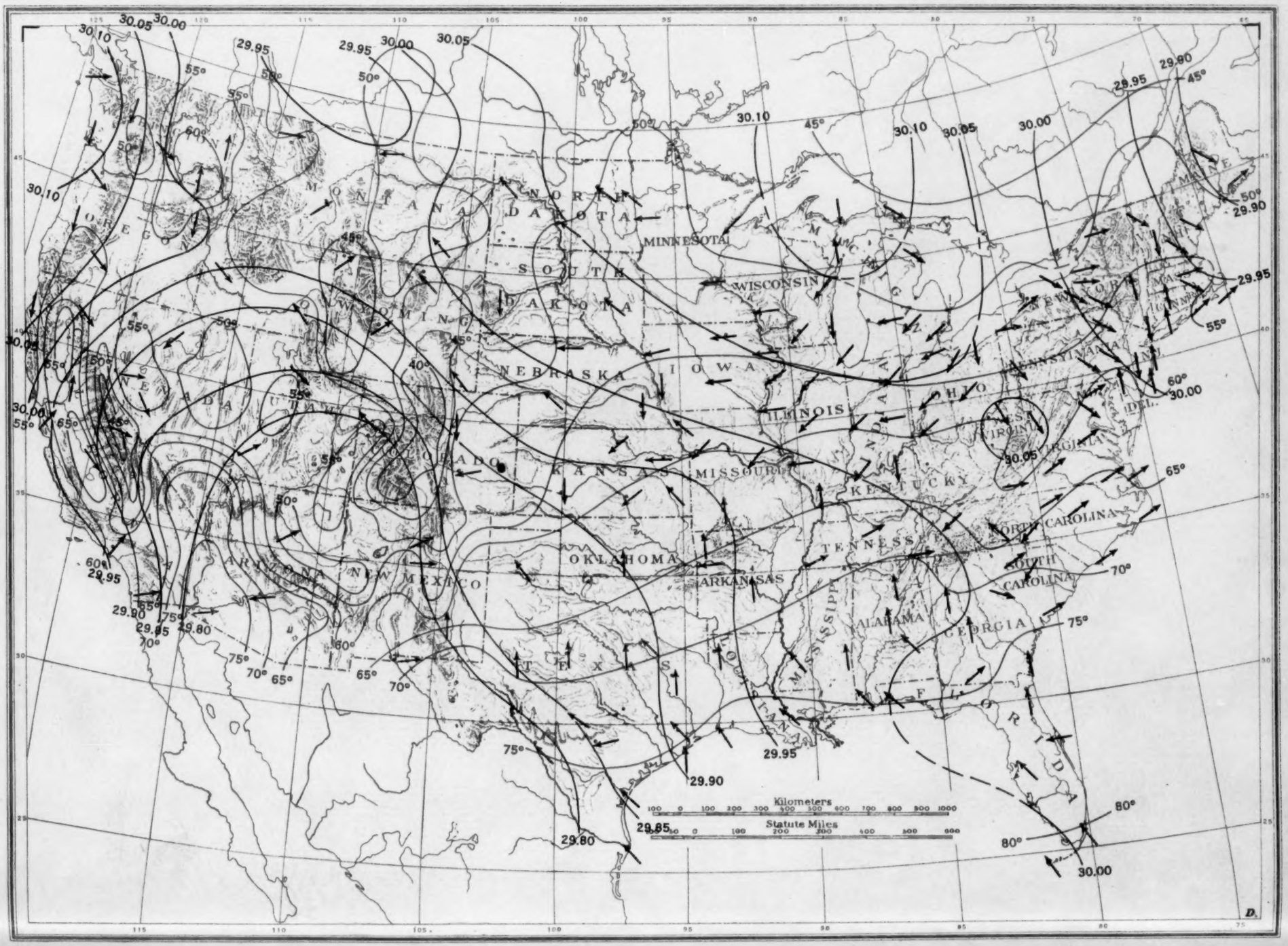


Chart VII. Wind Roses for Selected Stations, May 1935

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(Plotted by E. Corbin)

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